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ABSTRACT

This book is intended as a source for those who desire to apply a coherent system of instructional design, thereby insuring accountability. Chapter 1 covers the instructional design process, including: instructional technology; the role of evaluation; goal setting; the psychology of teaching and learning; task analysis; operational objectives; learner activities; the role of media; procuring media; pedagogical progress; and normative-referenced vs. criterion-referenced evaluation. Chapter 2 discusses perception and visual literacy. Chapter 3 addresses learner analysis, including the following components: sensory-motor, symbol manipulation, spatial relationships, oral communication skills, personal identity, cultural determinants, and interactional-transactional patterns. Chapter 4 focuses on layout and design. Chapter 5 discusses the World Wide Web, including hypertext and hypermedia, browsers, streaming, HTML, search engines, intuitive usage, Internet Service Providers, servers and Web hosting, Java and JavaScript, and integration of the Web into instructional design. Chapter 6 addresses e-learning, including challenges, efficacy, and the national educational technology plan. Appendices include a sample Web site, an HTML cheatsheet, and a list of associations and organizations for instructional technology. (Contains an index.) (MES)

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# INSTRUCTIONAL DESIGN

# SYSTEM STRATEGIES

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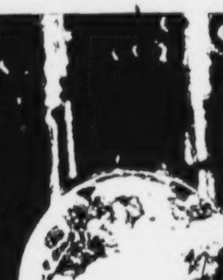

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# Instructional Design: System Strategies

# Instructional Design: System Strategies

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# CONTENTS

Acknowledgements *vii*

List of Figures *ix*

Preface *xi*

1. Instructional Design Process *1*
2. Perception and Visual Literacy *61*
3. Learner Analysis *83*
4. Layout and Design *135*
5. The World Wide Web *165*
6. E-learning *187*

Afterword *197*

Appendix A: Sample Web Site *201*

Appendix B: Reference HTML Cheatsheet *207*

Appendix C: Associations and Organizations for Instructional Technology *213*

Index *217*

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Most of all, the authors would like to express their most sincere thanks to both Amelia Ledford and Linda Sleeman for their many years of encouragement and support of the authors over many years of their professional careers. This is especially important as both Amelia and Linda have excelled at their own professional teaching careers while in continued support of their husbands. Amelia and Linda not only read and corrected drafts of the manuscript but also served as professional advisors to the first book *Instructional Design: A Primer* and this expanded book on the same subject. The authors indeed are fortunate to have had continued support and invaluable input on these books and are deeply indebted to them both.

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Summer 2002

# LIST OF FIGURES

Figure 1.1. Instructional design paradigm *4*
Figure 1.2. The Tyler model for setting goals *7*
Figure 1.3. Relevance *15*
Figure 1.4. Levels of cognitive thinking *28*
Figure 1.5. Levels of effective activity *30*
Figure 1.6. Levels of psychomotor activity *32*
Figure 1.7. Internalization: Externalization *33*
Figure 1.8. Display format for instructional design *36*
Figure 1.9. Distribution curve *46*
Figure 2.1. Figure-ground *77*
Figure 2.2. Embedded message using figure-ground *79*
Figure 3.1. Learner Analysis *87*
Figure 3.2. Auditory *92*
Figure 3.3. Visual *94*
Figure 3.4. Olfactory *96*
Figure 3.5. Savory *97*
Figure 3.6. Tactile *100*
Figure 3.7. Proprioceptive *101*
Figure 3.8. Kinesthetic *102*
Figure 3.9. Reading *103*
Figure 3.10. Writing *105*
Figure 3.11. Cognitive Learning Skills *106*
Figure 3.12. Computation *107*
Figure 3.13. Diagrammatic Planning *108*

Figure 3.14. Diagrammatic Interpretation *109*
Figure 3.15. Structure Analysis *110*
Figure 3.16. Speaking *113*
Figure 3.17. Listening *114*
Figure 3.18. Synnoetics *116*
Figure 3.19. Ethnic *117*
Figure 3.20. Religion *119*
Figure 3.21. Family *119*
Figure 3.22. Peer *120*
Figure 3.23. Mores *122*
Figure 3.24. Social Agency *124*
Figure 3.25. Politics *125*
Figure 3.26. Kinesics *126*
Figure 3.27. Proxemics *127*
Figure 3.28. Transactionals *128*
Figure 3.29. Ethics *129*
Figure 3.30. Empathic *130*
Figure 3.31. Esthetics *131*
Figure 3.32. Histrionics *132*
Figure 4.1. Dale's Cone of Learning *138*
Figure 4.2. Visibility Standards *141*
Figure 4.3. Projection requirements *142*
Figure 4.4. Optical legibility *144*
Figure 4.5. Visibility standards *145*
Figure 4.6. More visibility standards *146*
Figure 4.7. Eye direction *147*
Figure 4.8. Balance *149*
Figure 4.9. Pattern *152*
Figure 4.10. Harmony and balance *154*
Figure 4.11. Lines and attitude *155*
Figure 4.12. Simple–Complex continuum *156*
Figure 4.13. Storyboard card *160*
Figure 4.14. Storyboard card *160*
Figure 4.15. Storyboard card *161*
Figure 4.16. Storyboard card *162*
Figure 4.17. Storyboard *162*
Figure A.1. Resulting Web site *205*

# PREFACE

At the time of this writing the authors of *Instructional Design: System Strategies* have a combined experience of more than 75 years in the field of instructional technology in its various guises including Educational Media, Instructional Media, Educational Media and Technology, Instructional Media and Technology, Instructional Communication, and Audiovisual. This experience includes colleges and universities, the military as instructors and as consultants; public education as classroom teachers, consultants, and conductors of workshops and seminars; with business and industry as corporate trainers and trainers of trainers. Combined, they have published over 350 articles and research documents in professional referred journals, authored or co-authored, or made significant contributions to 35 books. Together, they have taught courses in instructional design/technology at the following universities in the United States: Auburn University, Boston University, Harvard University, University of Alabama, University of Arizona, University of Connecticut, University of Massachusetts and have conducted workships, courses and seminars in Barbados, Canada, Mexico, Colombia, Peru, Ecuador, England, Scotland, Italy, France, Germany, Puerto Rico, St. Vincents,and Switzerland. Additionally, they have produced and directed educational television programs, films, filmstrip series, transparency series, curriculum units, and computer software for both the world wide web and stand-alone software, radio for national distribution, and have founded and edited three international journals for national and international distribution. Dr. Sleeman is the founding editor of The International Journal of Instructional Media presently in its 32nd year of publication of wich Dr. Ledford is Associate Editor. The journal has published authors from eighty-eight countries 484 colleges and universities, 66 government, business and industrial sources, and 34 public schools and school systems.

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INSTRUCTIONAL DESIGN: SYSTEM STRATEGIES, pages xi–xii
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The majority of their career has been in higher education as administrators and professors in major research universities lecturing, writing, conducting research and outreach activities. During this time, as in so many other disciplines, Drs. Ledford and Sleeman have seen the field change so drastic that they could not have recognized it thirty-five years ago unless they had the powers of a prophet. The proverbial quantum leaps have occurred in communication (satellite communications), with the computer (especially the PC), and with software development. Research findings in education coupled with these developments, with the World Wide Web, with developments in cognitive psychology, and with pedagogical techniques like constructivism are changing how we go about teaching and learning.

Some things have, however, remained the same and have in fact taken on added importance. Most importantly, these developments without the rigor of instructional design are inert. By themselves, these changes are incapable of facilitating teaching and learning except as spurious applications and by serendipity. For example, during the 1960's and 1970's most schools and those accountable for training rushed to invest in television. School boards and school administrators, under pressure from all the concerned publics of education, built studios and elaborate television delivery systems. It appeared that television was the panacea to solve all problems associated with learning. Without the application of instructional design principles and the integration of the medium into the curriculum, however, television was doomed to failure as were all other techniques so implemented. Sadly, few school systems and organizations made this investment. Unfortunately, one stands to make the same mistake with the newest media, especially the World Wide Web. Too many school systems are rushing to wire buildings for the web and to buy equipment without considering integration into the curriculum, and without assuring that teachers and administrators have the knowledge and skills of instructional design to insure proper use.

As a result of the urgent need to avoid the mistakes of the past, society is witnessing an increasing value placed upon the process of instructional design, properly applied, and professionals with the skills of instructional designer are being highly sought by schools, military, health and allied fields, government, business, and industry. This book will serve as a source for all persons who desire to apply a coherent system of instructional design, thereby insuring accountability. With the national educational initiative recently passed by congress, accountability is even more imperative today.

## CHAPTER 1

# INSTRUCTIONAL DESIGN PROCESS

### PURPOSES

A theoretical framework within which to apply system strategies is necessary for the instructional designer. This framework can be represented visually in a paradigm. This superstructure is eclectic; it presents views commonly held by instructional designers and has been synthesized from the research and literature. The total view is different from aggregate views commonly held in that it describes a process that is internally consistent; that is, it embraces a specific approach which makes it possible and easier for the designer to apply theoretical principles. Most perspectives on instructional design describe disparate processes without adequately providing an opportunity for closure. As a result, many designers go away confused, owning bits and pieces of a process that they find it impossible, or at least difficult, to implement in a coherent fashion. As gestalt psychologists, the authors believe that a process of instructional design should be philosophically congruous internally.

### INSTRUCTIONAL TECHNOLOGY

An instructional technologist is a professional who uses a systematic way of designing, carrying out, and evaluating the total process of teaching and

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learning. If teachers establish instructional goals and objectives based on a rigorous process, and if the goals and objectives are consistently derived and communicated along with rationales to learners, the teachers are instructional technologists. These teachers provide learning activities appropriate to the stated (or implied) goals and objectives and appropriate to the needs and interests of the learner. Needless to say, when teachers do not rigorously apply principles of instructional design, learning activities are usually omitted, inappropriate, or lacking proper depth and focus. When the opportunity to practice prerequisite tasks is not provided, when analogous and equivalent practices of the skills, concepts, and attitudes are not purposefully designed, learning is likely to be inefficient and occur only by vagary, or by chance.

## THE ROLE OF EVALUATION

The purpose of evaluation should be to determine the effectiveness of the instruction. All learners are capable of learning. Anything can be taught to anyone in an academically honest manner. Whether or not the learner in fact learns is dependent upon the process to which he is exposed. Evaluation should not be made to compare "how much" a given learner learns in comparison to another learner but in comparison to the stated goals and objectives. If the evaluation shows that the instructional design is effective, then by definition the learner has learned.

## THE RIGOR OF INSTRUCTIONAL DESIGN

The better instructional technologist is one who imposes a logical rigor, supported by decades of reliable research in the process of instructional design and conduct. Such a rigor includes the following: goals and objectives are established according to specific sources utilizing concrete data to filter them through screens of instructional philosophy and educational psychology. Objectives are designed to provide a logical distribution throughout selected areas of a rational taxonomy. The achievement of each of the objectives is a step toward achievement of the goal. The sum of achievement of all objectives should constitute achievement of the goal. Objectives consist of terminal learner behaviors, conditions within which the behavior is to occur, and standards of performance to be used by students to determine progress, and to be used by teachers to evaluate degrees of success of the instruction. Goals and objectives should be communicated to learners along with a rationale that is inductive, deductive, exhortative, or intrinsic in nature. Prerequisite tasks should be isolated and instruction designed for them. Analogous and equivalent practices should be planned and implemented whenever direct purposeful activities are impractical. Media should be selected and integrated into the learning event based on their relevance to the characteristics of the learner and of the environment.

Curricular restraints should be identified and neutralized when possible, and acquiesced to where necessary, but curricular restraints are seldom really constraining. Criterion checks should be performed at determined intervals to evaluate the progression of successful instruction. All of these elements are a part of design of learning events, or instructional design. To be effective, each element of the pattern ought to be internally consistent with all other elements. Each is a part of the whole process; each is no more or less important than any other part.

## Synergy

Many professionals have the misconception that instructional technology is limited to machines, or hardware, and programmed instruction and computer assisted instruction are conceived as synonyms for instructional technology. While hardware is part of the process, it can be a part of other processes than instructional technology. Instructional technology is a system that goes beyond any particular medium or device. As with all systems, it is more than the sum of its parts; there is an essence or force inherent in instructional technology that brings about more effective instruction when appropriately applied. The "essence" or "force" is simply the logic of knowing what is intended, knowing for whom it is intended, being able to structure a means of getting "for whom" to practice, error free, what is intended, evaluating by criteria the progress of learning, arranging events to include application of what is intended, and calling whatever it was "learned" when the intended standard is overtly obtained. Instructional technology employs a combination of human and non-human resources.

Figure 1.1, Instructional Design Paradigm, represents the rigorous steps and components in the instructional design process which serves as the foundation for this book. Each component of the paradigm will be presented with discussion.

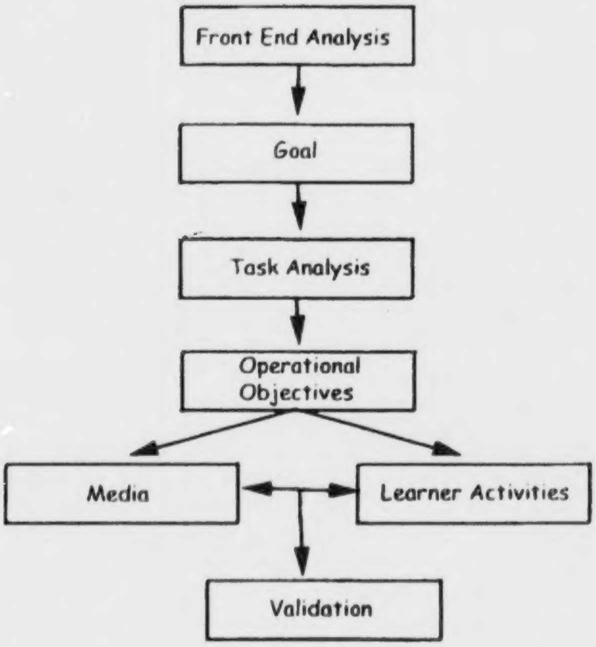

Figure 1.1. Instructional design paradigm

## Goals

A critical task in the process of instructional design is to write goals, which meet the needs and interests of learners. Goals should not be taken lightly or left to intuition; they should be incorporated only after a rigorous application of procedures consistent with general systems theory. In general systems theory, a group of elements (i.e., goals, objectives, resources, etc.) are treated as a unit and the system of elements as a whole has properties not possessed by the individual elements. Because changes in one or more of the elements affect other elements and the whole, all elements are equally important. A poorly stated or conceptualized goal negatively affects all the other elements within the system whereas a well stated goal enhances the probability of effectiveness and efficiency of the process.

Complex tasks such as instructional design, and in particular goal writing, are faced with uncertainty from within and without, but at the same time these processes are subject to rationality, and hence need certainty. Feedback, in the form of criterion checks, provides the data necessary to work within the synthesis. It is through the use of this feedback that goals can be modified as needs arise, massaged to fit the needs of the learner.

## CHARACTERISTICS OF GOALS

Goals, like the whole process of instructional technology, are operational on several levels. One can isolate goal statements subscribed to by state departments of education (or state educational agencies) and by school districts in their curriculum statements. Schools within districts will ordinarily have developed formal goal statements. The emphasis in this book is pragmatic and applicable to the specific classroom or even the specific learner. Goals written on the district/state level are probably too broad to be of specific usefulness to the specific classroom effort. This is not to imply that goals written by the instructional designer are to be substituted for the district or state goals (we do not generally have that privilege); rather the district/state goals need to be modified to suit classroom needs. These goals can be considered (if necessary) in addition to those goals mandated by authority, or at least complimentary to those goals. The goals of the district/state will be more likely achieved when they are modified to serve the needs of learners at the local level.

Goals are frequently unclear, but complications are the fault of the goal designer. Goals need not be complex or abstract. For genuine, realistic learning, goals should be written as overtly and concretely as they can be written. Their formulation and application are critical to the instructional process. A goal ought to state the exact aim, purpose, or end to any course of action. The statement is a point of departure from which the more specific and complete operational objectives are developed

### Goals Should be Written in Terms of Learner Behavior, Not Teacher Behavior

From the learner's perspective a goal is a consequence he expects to attain. Since goals direct an effort, the teacher's role is to write a goal and to arrange a motivational strategy, which will encourage the learner to learn. The strategy is to provide a rationale from the point of view of the learner.

Goals can be described in the broadest of terms. Such terms as "to know," "to understand," "to appreciate," "to grasp the significance of" are acceptable. Even though the use of broad terms is "acceptable," the use of operant terms expedites the effect of the goal statement.

Goals, however, are reached through the achievement of objectives. Objectives, unlike goals, must be written operationally: that is, in performance terms. They must specify the intended or terminal behavior, the conditions within which the behavior will be manifested, and the standard or minimally acceptable level at which the learner will exhibit the terminal behavior. Chapter 4 is devoted to writing operational objectives.

Unlike goals, objectives must, to be consistent, lead to the achievement of the clearly defined goal. When the goal has been achieved, the learner will have closure; also, the achievement of the goal should logically lead to the next goal.

## OVERVIEW

In the recent past we have experienced an incredible explosion of human knowledge. Advances in technology, science, and communications have generated an explosion that is progressing geometrically. The effects of the explosion are far reaching, affecting professionals, students, and lay persons. Reported research in journals is sometimes out of date before the journal reaches the bookshelf; today's "facts" become tomorrow's misinformation.

Learners on all levels are bombarded with more and more knowledge, which they must synthesize. No one, practicing professional or any level student, can learn all there is to learn, nor should they be expected to do so.

Increasingly difficult decisions must be made concerning what is to be taught, to whom, and to what degree, how, and (perhaps most importantly), why?

In *Basic Principles of Curriculum and Instruction,* Ralph W. Tyler provides a model for making decisions about goals. The rationale put forth in the book involves identifying four fundamental questions of enduring importance:

1. What educational purposes should the school seek to attain?
2. What can be provided that is likely to attain these purposes?
3. How can these educational experiences be effectively organized?
4. How can we determine whether these purposes are being attained?

In answering these four questions Tyler used a blend of logic and common sense. He suggests that we consider as sources of goals the learners themselves, society, and subject specialists.

At this stage of development, a goal developed within the direction provided by these sources should be considered as a preliminary goal statement; the goal should then be screened through a philosophy and a psychology of teaching and learning after which it can be considered a formal goal statement.

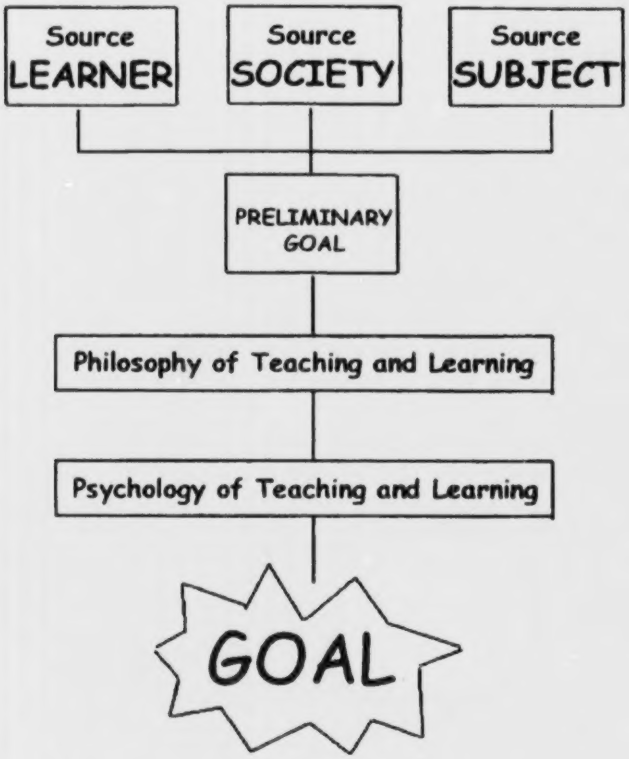
Source
LEARNER
Source
SOCIETY
Source
SUBJECT
PRELIMINARY GOAL
Philosophy of Teaching and Learning
Psychology of Teaching and Learning
GOAL

Figure 1.2. The Tyler model for setting goals.

The intent of this section on goal writing is to provide a logical, pragmatic process of instructional design for the purpose of providing predictable and validatable learning, while attempting to avoid the esoteric and the pedantic which is so ubiquitous in texts on instructional design.

## THE LEARNER AS SOURCE

Without data from learner analysis, appropriate design occurs only by chance. The better and more comprehensive our analyses become, the better our goals and the design of learning experiences are going to be. Human variability and individual differences are facts. By giving constructive efforts to analysis for a battery of learner characteristics, the instructional designer can improve the process predictably and observably.

Learner analyses are important because most learning requires a specific entry behavior. For example, before a learner should be expected to solve problems in long division, he should first be able to solve problems in multiplication. If a given learner does not possess appropriate entry behaviors, a decision ought to be made to remediate the learner or to change the goal/objective.

Learner analyses should indicate when a learner possesses or lacks the behavior solicited in the learning. This is usually accomplished by a means of a "pretest." Obviously, if the learner already possesses the behavior, another goal/objective should be chosen.

Achievement levels vary enormously among learners of given ages. Add these levels to the differences within each individual from subject to subject and human characteristic to human characteristic and instructional designers find themselves confronted with patterns as ordered as disarranged jig-saw puzzles. Yet, these stubborn facts must be taken into account in writing goals.

Two characteristics exist of learners that should be analyzed: (l) their needs, and (2) their interests. Analyses of a learner need only suggest goals when the information about him is compared to some acceptable standard. The difference between the present condition of the learner and the desired condition ought to be discernible. Many interpretations of needs exist ranging from Maslow's hierarchy of needs to Prescott's classifications of needs. However, for purposes of writing educational goals, specific learner needs must be considered in addition to the types of needs outlined by Maslow and Prescott. In order to establish specific needs in specific areas, the learner must be compared to an acceptable standard. Standards can be established by either of two methods: (1) criterion-references, or (2) normative-references.

Using a criterion-referenced method, a decision about an acceptable standard of achievement in each area of analysis is made, based on the characteristics of the subject (content) as perceived by the subject specialists and the perceptions of the teacher, learner, parents, and community. Goals are written that conform to these analyses. The instructional designer can write a goal that leads to raising the reading comprehension levels of learners because the community wants learners to be able to read at a given level. Or, a decision might be made that first-year keyboarding students should be able to type 45 words per minute with no more than three mistakes in a timed exercise. This decision is made regardless of how well "average" first year keyboarding students can type at the end of the year.

Using normative-reference, each learner is compared to other learners. These comparisons can be made of local learners with others from local, state, or national databases. For example, the learners in a fifth-grade math class can be compared to fifth-grade math students across the nation using national norms, or the learner can be compared to regional or state groups with the same intent, or he can be compared to any other single group anywhere with the comparable effect. The result is that one learner is compared to other learners to evaluate his performance in relation to the "average." If a difference exists, it is discernible and a judgment can be made about establishing goals in that specific area. For example, when compared with other learners across the nation, the learners in a given school may be below "average" in reading comprehension. A goal might be written that, when achieved, leads to raising the reading comprehension of the learners of that school to a desired level (e.g., national average).

Progressive education philosophy favors comparing a learner to a stated criterion rather than to a norm. Many feel that norm references lead to mediocrity in educational programs by creating a sense of false security and by emphasizing the status quo in curriculum.

Learners' interests must also be taken into account when writing goals. If learners see no value or utility in learning a particular cognition, skill, or attitude, they are less likely to do so. Unless they see what they can do with what they learn and accept the logic and rationale for doing so, they are likely to forget almost all they have learned as soon as they are no longer obligated to its recall and commission.

Several techniques of gathering information about learners exist. Techniques range in sophistication from informal teacher observations to computer analyses. Of the less formal techniques, better sources include achievement and other normative-referenced tests and data. Such information is compiled through school district self-study for accreditation teams, and the instructional designer has only to request it from the appropriate school official. Observations by the instructional designer, the oral or written interview, school health records, and past academic performances also provide data.

Comprehensive techniques of learner analysis do exist. They provide data for which the analyzer might have more confidence than data from the less rigorous techniques of observation and interview. Cognitive Mapping is a technique developed by Joseph E. Hill of Bloomfield Hills, Michigan. Cognitive Mapping accepts Mager's premise that no two students seek meaning in exactly the same manner. Hill believed that 90% of the learners who are physiologically and psychologically sound can learn 90% of the material 90% of the time if the teaching methods and media are adjusted to the learner's educational cognitive style. He was not alone.

An individual's cognitive style is determined by the way he takes note of his total surroundings—how he seeks meaning, how he becomes informed. The cognitive map answers the questions: Is he a reader or a listener? Is he concerned only with his own viewpoint or is he influenced in decision making by his family or associates? Does he reason as a mathematician, or as a social scientist, or as an automotive mechanic? Results from a battery of tests and inventories are processed through a computer to produce a map of cognitive traits that describes the many ways each learner seeks meaning and the information can be used to build a personalized program of instruction.

A comprehensive technique of learner analysis presented in Chapter 3 is the basis for implementation of the techniques described in this book. A common reaction by many who first study this technique is that it is too expensive and too time-consuming to implement. However, an argument can be made that failure to make the analysis is potentially more damaging to the educational effort. Also, analyses of these mental processes are consistent with current cognitive psychology research and the analysis can provide a pragmatic solution to the problem of learner analysis.

There is no single formula for writing goals from the data gathered about learners. Studying the implications, comparing the data with standards, using the subject content and community as sources, and filtering these impressions through a philosophy/ psychology screen will suggest goals. In an emerging-systems model, feedback from criterion checks will enable the instructional designer to modify any part of the process.

## SUBJECT SPECIALIST AS SOURCE

In order to incorporate realistically the input about goals from the subject specialists, one first must answer the question of whether the subject content is to be used in specialized education or in generalized education. General education includes the knowledge, attitudes, and skills that all learners need to possess in order to live successfully in a free society; to continue to grow mentally, ethically, and aesthetically; and to develop in all other desirable ways. Historically, when asked to recommend goals and objectives, subject specialists have tended to specify goals that are too technical, too specialized, or generally too inappropriate for large groups of learners. For example, historians tended to specify goals that were best suited for learners who were training to be historians, and as a result many learners did not succeed; thus, they dropped out or were promoted without experiencing success. Obviously, for learners who are in specific subject areas, the subject specialists are obligated to reflect within the goals the rigor and specificity required to give the learner the expertise demanded.

A second concern about using the subject specialist as sole source is that specialists tend to be essentialists rather than progressivists. In other words, they tend to place primary, or sole, emphasis on the body of knowledge collected over the centuries as the source for deriving goals, and for preparing the learner "for the future." The progressivists, on the other hand, depend primarily on studying the learner's needs and interests. The progressivists consider those factors which influence this learning for primary emphasis, and, like Dewey, believe that education has no end beyond itself. It is its own end; it is a process of living, not just of preparing for a living.

But one must not discount input from subject specialists; this input is critical in relation to the process. One can obtain input from a variety of subject specialist sources, but perhaps the best sources are national professional organizations such as the *National Council of the Teachers of English*, the *National Council for Social Studies*, and the *National Council of the Teachers of Math*. Selected current titles of books, pamphlets, monographs, brochures, yearbooks, and journals from the *National Council of the Teachers of English* include *Conducting Experiences In English* (based on the contributions of 274 teachers of English), *Current English Usage, Language Arts for Today's Children, English, Education, and the Electronics Revolution, Facts About Current English Usage*, From *Thoughts to Words, The Sentence and the Paragraph, The Teaching of Writing in our Schools, Accountability and the Teachers of English, On Writing Behavioral Objectives for English*, and *Deciding the Future*, (a forecast of responsibilities of secondary school teachers of English 1970–2000). Similar titles exist in the social studies area, the math area, and in most other academic disciplines.

On-going leadership for the instructional designer comes from ASCD through such reports as *Improving the Human Condition: A Curriculum Response to a Critical Reality and Considered Actions for Curriculum Improvement*, and from the *Association for Educational Communications and Technology* (AECT) through its *Journal for Instructional Development*.

Because he embraces a progressive philosophy and looks to national professional organizations for leadership, the subject specialist is an integral part of the process of writing goals. This input is no less, or no more, valuable than any other source.

## SOCIETY AS SOURCE

No single source in the Tyler Model exists to the exclusion of the other sources. Those elements that have been discussed in detail (in either the sections "The Learner As Source" or "The Subject Specialist As Source") can also be considered as societal sources as well and perhaps some of the elements deserve major consideration within this context.

Until recently, the educational goals of schooling were quite limited. Schools had to teach a few fundamentals in order for students to learn the laws of the land and the principles of religion. Societies tended to stagnate as evidenced by the attitude of the era toward the past, the present, and the future. As with the classic "Sabre Tooth Curriculum" leaders felt the most sensible education for a child was to gain the skills from the past. There was failure to recognize the need for goals oriented to the present and to the future. The past would become the future; it was a simple, and for later times, a primitive outlook. The coming of the industrial revolution and the mechanical age brought a change in the demands placed on the curriculum. Society demanded that schools pre-condition learners to live in a world based on the industrial model. To pre-condition the learners, the schools themselves took on the mantle of the industrial age. The administrative hierarchy, the organization of knowledge into permanent disciplines, the concept of assemblage of raw materials (students), and processing in the schools (factory) by workers (teachers) illustrate the phenomenon. Society demanded a worker whose life was no longer regulated by the sun, the moon, or the seasons, but by the factory whistle and the clock. To pre-condition people for this environment, schools required learners to practice collective discipline, to march to and from classes, to sit at assigned seats (work stations), and not to carry on conversations (so as not to interfere with production), and they regulated learning by the bell (factory whistle). Today, we are moving past industrialism into an age of superindustrialism, an age in which standardization and centralization, specialization, synchronization, maximization, and concentration no longer touch every aspect of life. The mass media are becoming "demassified" as more alternatives to network television (cable and satellite television, videotapes, videodisks, and video games) become available. Nuclear families are being replaced as the model while "electronic expanded families" and many other types are becoming accepted as the norm. Renewable energy sources are sought; the home (each one with a microcomputer in it) is becoming the center of society for both work and leisure as opposed to the factories and offices. Mass production is being replaced by custom (sometimes called designer), production and once again, the consumers are being their own producers (prosumers). Even such mighty institutions as the corporation and the nation-state are showing signs of deterioration as the new tide rushes in. And massive changes in our technosphere and infosphere will inevitably have tremendous effects on the sociosphere and psychosphere.

According to split brain theory, western cultures have tended to be left-brain dominated. Neurologists, psychiatrists, and learning theorists have recently discovered a conflict between the left and right hemispheres of the brain. The left hemisphere of the brain is the logical and the connecting lineal hemisphere of the brain while the right hemisphere is the creative and simultaneous (rather than lineal and logical).

Our schools (like our legal system, our government, and our business world) tend to be lineal, connected, nuts and bolts bureaucracies of hierarchies with organizational charts predominating. All of these are characteristics of the left brain dominance. With this change in orientation, we added major categories to the goals of education. Schools were expected to

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be the main change agent in solving problems of poverty, in teaching morals, in taking care of crime and delinquency, and even in providing peace. These responsibilities coupled with the knowledge explosion made the task of establishing educational goals a seemingly impossible one.

Within the recent past we have experienced an educational revolution as we move from an industrial society dominated by the left hemisphere of the brain to a super-industrial society orientated to the right hemisphere of the brain. The new dominance favors, instead of line and linearity, quality of life. The quantity of jobs, the quantity of marks, and the quantity of wealth order the old left hemisphere. The right hemisphere preference is for the quality of life. With the super-industrial age comes a demand that we revolutionize the goals of the curriculum. We need to be focused to the future.

The goals we establish need not be mindless holdovers from the past. Teachers should challenge the *status quo*, make every effort to insure that the goals they establish for learners are focused at least toward the present, and better yet, to the future. They must realize that teachers may meet resistance in their efforts and allow folk logic and provincial community pressure to interfere as little as possible. Teachers are the professionals; whether the learner learns, how he learns, and what he learns is primarily their responsibility.

## PHILOSOPHICAL SCREEN

Once a preliminary goal statement based on the learner as a source, subject specialists as a source, and society as a source is written, the statement is filtered through a philosophical screen. As with the overall process of goal writing, this step is not to be taken lightly; the screening must be rigorous; the philosophy base must be there. This philosophical base should not be just rhetoric; rather, it should be at the level at which the instructional designer has organized a well thought out philosophical system. The design should become characterized by the value complex created by the system.

Many educators spend a great deal of time philosophizing about life in general and about education in particular. In fact, they seem to spend more time philosophizing than they do living or educating. It is easy for instructional designers to become pedantic. In theory, instructional design may be esoteric, yet it should not be so esoteric to preclude the application of instructional design benefits. Yet, to be effective instructional design demands harmony, firmness, agreement of parts to one another and to the whole-in short, internal consistency.

Many beginning instructional designers have not yet consciously organized a value complex (philosophy) and this omission makes it much more difficult to design a series of validating learning events leading to the achievement of a goal. Most school districts have a stated philosophy that will affect teaching and learning in many cases, but the greatest effect is going to stem from the individual instructional designer's philosophy.

The implications are clear. Before writing goals and subsequently designing the complete learning event, the designer should first review the official philosophy of the district and/or school. Sometimes local philosophies impose restraints that the designer must recognize. Philosophies will vary from district to district and from school to school within a given district, but one is likely to find items of commonality, such as subscribing to the worth and dignity of individual learners. A second implication is that the instructional designer must have a philosophical base through which to screen the goals and subsequent elements of the learning event design. Ideally, the individual's philosophy should not be in conflict with the philosophies of the district or school. If there is disagreement, sometimes it is possible to implement one's own philosophy without direct conflict, especially if the district/school philosophy is not rigorously applied.

One philosophy serves to screen specific goals is described here:

The worth and dignity of learners, found to be aspects of most philosophies, most texts on educational psychology, most learning theories, and most school statements about their philosophies, make instructional design the only valid process in writing and attaining an intensively subscribed goal.

Instructional design is expensive and time consuming, but failure to design is more expensive, and potentially more damaging to the educational effort. Instructional design can provide to be a tenable route to accountability. Each learner is seen to be unique in that each learns in different ways and at different rates. Each learner has individual wants, needs, interests, capacities, capabilities, preferred learning styles, and is under a unique set of personal influences. Conditions exist within learners as a part of their uniqueness that may preclude learning, or cause distortion of message reception and response outputs.

As long as learners are psychologically and physiologically sound they are able to learn. Whether or not they do learn is a function of the general process to which the learner is exposed. The three factors within this process are relevance, motivation, and appropriate design of the learning event.

## Relevance

If a learner sees no value or utility in learning a given thing, he is less likely to learn on a long-term basis. Unless he sees what he can do with what he learns, and accepts the logic and rationale for doing so, he is likely to forget almost all he has learned as soon as he is no longer obligated to its recall and commission.

Economy of effort is important in the learning process. There is so much to be learned that choices must be made. Some things need to be deferred or deleted in favor of others; there is a priority of learning events. Economy of effort is also influenced by how learners learn. They learn most efficiently when strategies are designed to suit their needs. No two learners can be assumed to learn optimally under the same conditions. An analysis of the conditions within which the learner learns most, and within which the learning lasts longest, is transferred most readily and with versatility, is highly contributive to economy of effort and the generation of long-term learning. These factors are displayed in the model of relevance in Figure 1.3.

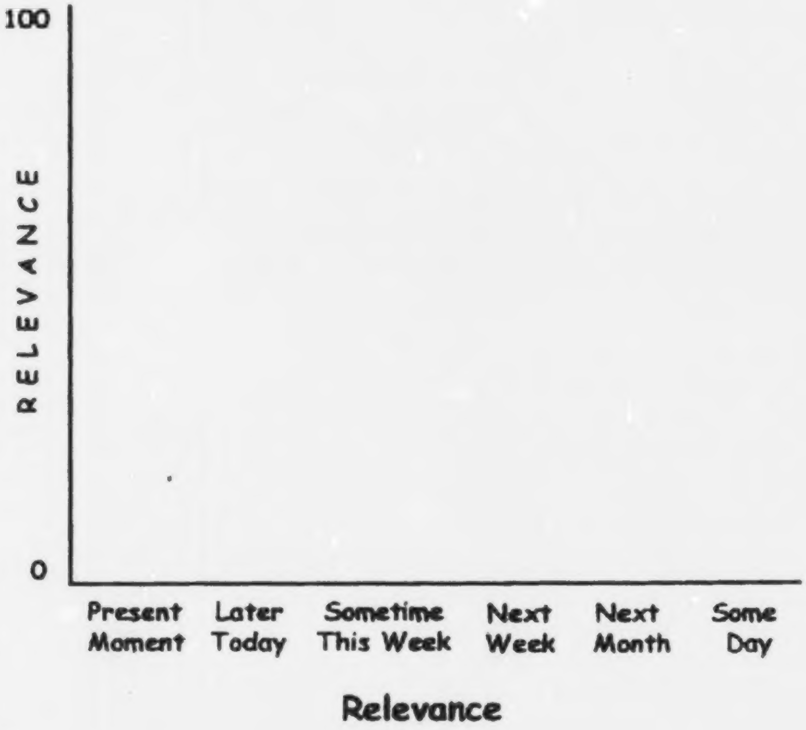

Figure 1.3. Relevance

### Motivation

Motivation is seen to be a condition without which learning is absent, or is short-term. Without adequate motivation, learning is likely to be slow and uneconomical. Aspects of motivation which have to be taken into account include:

1. Physiological,
2. Psychological,
3. Sociological,
4. Ego, and
5. Self-fulfillment /self actualization

These levels are hierarchical in nature. That is, before any higher learning can occur, each previous level must be satisfied. If a learner has physiological needs they must be addressed before he can progress to the next level—psychological. An individual learner can be determined to be at a specific point within the continuum. The goal is to become self-fulfilled/ actualized.

Maslow states that in the absence of satisfaction of certain physiological needs, effective learning does not take place. There are basic physiological drives that have to be satisfied, to varying degrees, in conjunction with the relevance to what, and how a learner is to learn, in order to boost motivation. Hunger, thirst, air hunger, fatigue, sex, the need for sleep, degrees of warmth or cold, pain, bowel and bladder tensions are physiological needs, among others, that have to be fulfilled.

Included in psychological and social needs are the needs for rewards, the need for comfort by others, the need to investigate, the need to achieve, and the need to be accepted by others.

Ego and self-fulfillment needs which have to be met include needs for contact with reality, progressive symbolization, increasing self-direction, a fair balance between success and failure, and attainment of self-hood.

Meeting the hierarchy of needs makes one self-actualized. The logical conclusion, then, is to refine a philosophy of education. This philosophy should answer the questions: what should be taught, to whom, to what degree, how, and why?

## PSYCHOLOGY OF TEACHING AND LEARNING

A second screening of the preliminary goal statement occurs at this point. The preliminary goal has been written and is based on the learner needs and interests, the subject specialists and the society as sources; it has been rigorously screened through a philosophy of teaching and learning held by the administrative unit, and perhaps more importantly, through one held by the instructional designer.

For whatever reasons, administrative convenience, cost factors, resistance by key concerned publics (school boards, parents, etc.), it often appears that education, unlike most other professions, is negligent in incorporating all that is known about teaching and learning. In fact, as mentioned earlier in this chapter, many consider it ignoble to learn how to teach; many consider it ignoble to consider any sources of goals other than subject content; and, many would not use a systematic process in teaching and learning. There are those who are quick to convict this process as being de-humanizing and debilitating to learners, and threatening to their integrity. Many would rather continue to be ineffective and have learning occur by chance, out of context, or in spite of their efforts. To do so is easier, they believe, and folk logic places the failure to learn almost entirely on the learner, and rarely on the teacher. A teacher can usually defend himself by saying that the learner should "try harder" or exhibit greater desire or "want to" as if effort or desire alone was sufficient. It is highly unpopular among almost all concerned publics to place the primary responsibility for learning on anyone but the learner. The systematic process presented in this book is the antithesis of these perceptions.

Many learning theories exist, some have elements in common, and the theories are applied with more or less rigor, depending on the abilities and inclinations of the instructional designer.

Two over-arching learning theories currently exist.

## Behaviorism

J. B Watson, the father of Behaviorism, defined learning as a sequence of stimulus and response actions in observable cause and effect relationships. The behaviorists' example of classical conditioning demonstrates the process whereby a human learns to respond to a neutral stimulus in such a manner that would normally be associated with an unconditioned stimulus. The classical example of conditioning is the experiment conducted by Pavlov. The focus of his experiment was the digestive process in animals. In conducting the experiment, Pavlov conditioned the dog to salivate (respond), upon hearing the ringing of a bell. This occurred because the dog had learned to associate its unconditional stimuli (normally feeding), with the neutral stimuli of the bell ringing simultaneously with the feeding process. Watson, believed that the stimuli that humans receive may be generated internally (e.g., hunger), or externally (e.g., a loud noise).

B.F. Skinner expanded on the foundation of Behaviorism established by Watson and on the work of Edward Thorndike, by focusing on operant conditioning. According to Skinner, automatic behavior is either strengthened or weakened by the immediate presence of a reward or a punishment. The learning principle behind operant conditioning is that new learning occurs as a result of positive reinforcement, and old patterns are abandoned as a result of negative reinforcement

Skinner wrote:

> The application of operant conditioning to education is simple and direct. Teaching is the arrangement of contingencies of reinforcement under which students learn. They learn without teaching in their natural environments, but teachers arrange special contingencies which expedite learning, hastening the appearance of behavior which would otherwise be acquired slowly or making sure of the appearance of behavior which otherwise never occur.[1]

Skinner further stated that more complex learning could be achieved by this process of contingencies and reinforcement through successive stages in the shaping process, the contingencies of reinforcement being changed progressively in the direction of the required behavior.

Behaviorism, as an approach to learning, has had a powerful influence on learning. The concept of directed instruction, whereby a teacher is providing the knowledge to the learner is an excellent example of behaviorism. The use of normative exams to measure observable behavior of learning, the use of rewards and punishments in our school systems, and the breaking down of the instruction process into "conditions of learning" (as developed by Robert Gagne), are all further examples of the Behaviorist influence.

With the advent of the computer in school, C.A.I., or computer-assisted instruction, became a prominent tool for teaching, because from a Behaviorist perspective, it was an effective way of learning. CAI relied heavily on the drill and practice approach to learning new concepts or skills. The question acting as the stimulus elicited a response from the user. Based on the response a reward was being provided. The "contingencies" of learning were translated into different levels of the program. Rewarding the user to a different level for correct responses follows exactly the approach of operant conditioning. Educators espoused CAI as an effective teaching approach because it allowed for self-paced instruction and it liberated them from the direct instruction of all their students so as to focus on those students with particular needs. This approach, left alone, severely limited the potential of the PC. As with most significant developments in our human experience, as the technology is perfected the creative applications emerge. With the liberation provided by the PC, the paradigm began to change. The result has been to change the process of how we go about teaching and learning.

## Constructivism

Learners learn what learners do. Learners do not learn, necessarily, what teachers do. When learners spend most of their time listening, apparently, while the teacher speaks or performs, it is improbable that anyone can do more than guess what they are, in fact, learning.

Webster's dictionary defines the word construct as follows: "To build; to frame with contrivance; to devise." Present day education involves a view of constructivism which includes a focus on effort instead of ability. Constructivism places the learner in an active position of learning which involves formulating various concepts in order to resolve a problem. This process enables the teacher to lead or coach while the student experiments in order to learn.

Child Psychologist Jean Piaget is well known for the theory of cognitive development. This development is explained by means of how and why mental abilities alter as time passes. To understand this theory, one must see that children are active organisms. Piaget revealed that a child manipulates and actively interacts with his or her surroundings in order to develop. Thus the development of cognition occurs as children build and understand that which surrounds them. The experiences and interactions a learner has with the information, both old and new, with which they come in contact, and their individual concept of reality affects their cognition. Visual literalists contend that the sum of one's experiences and the abilities of the learner to have and integrate sensory experiences affect cognition.

Educational psychology acknowledges the principle that students cannot just be given knowledge by an instructor. Knowledge must be constructed, or devised, by each student. The teacher merely acts as a facilitator of information by providing a conducive atmosphere that gives the material relevance and significance in the eyes of the learner.

Constructivist theories establish that learners, on an individual basis, use past and present bits of information in order to reveal and transform data as they are introduced to them. This is a continual process, which proposes that students become much more involved in the learning process, thus being called student-centered instruction. Once again, as mentioned earlier, the instructor guides or leads the student, but the student is encouraged to discover and unleash an individual meaning and understanding.

## The History of Constructivism

Constructivism is not a concept that just recently hit the internet. Its history dates back not only to the work of Piaget, but also Educational Psychologist Lev Semionovich Vygotsky. Actually, Vygotsky's theories seem to gain more attention from modern constructivists. His theories place emphasis on discovery and cooperative learning. His studies proved that in many cases, a child learns by interacting with peers who have established higher capabilities and with adults. Vygotsky also recognized that a child can learn to resolve a problem by thinking his or her way through it. This method of learning is referred to as social learning.

Another part of the foundation of constructivism lies on the concept of the zone of proximal development. Children are working in this zone when they are being assisted by adults or peers. Vygotsky's theories also presented the idea of cognitive apprenticeship. This process refers to a situation in which the learner obtains competence by interaction with either an advanced student or an adult who has proficient knowledge. An example of this would involve a new worker training by means of an apprenticeship.

One other theory of learning which Vygotsky stresses is mediated learning. Another term for this is scaffolding. It implicates the instructor assigning complex, yet practical task work to the student and providing adequate leadership so that the end result will be achievement.

The concept of "audiovisual aids" is no longer one that a knowledgeable professional would attempt to maintain or defend. It is a flaccid implication of a concept which lies at the heart, the root, the mainstream of learning theory, communication theory, and pedagogy. Consider the following: Learning is a behavioral change that is stable over a period of application. When undesired side effects are a part of the learning experience, further learning is needed to eliminate them. The phrase "behavioral change" does not refer to the learner's deportment, or social behavior. In a psychological sense it implies that a change has occurred in the behavior patterns of the individual. Whenever such changes occur, regardless of how, it is as a result of learning. Behavioral changes do occur in the psychomotor, cognitive, or affective domains. In the past, many persons have limited learning to "knowing" or "understanding." In the present, it has been clarified that "to know" or "to understand" when one "knows" or "understands" is diffusive, uncertain, and subjective—even biased. In the current definition learning includes recall, comprehending, applying, analyzing, synthesizing, and evaluating in the cognitive domain in addition to elements in the psychomotor and affective domains. Learning is not limited to simple memorization of facts.

In the final analysis, goals are considered as the heart of the instructional process. While no simple formula exists for writing goals from data about learners, from what subject specialists say should be learned, and from societal expectations, and while one can rigorously screen preliminary goal statements based upon the aforementioned sources through the screens of philosophy and psychology, these elements are a necessary guide in making judgments about goals. These elements provide a more intelligent basis for applying the decision making process. It is critical to emphasize the importance of studying the learner to find out his needs and interests and what factors influence his learning before establishing goals.

## TASK ANALYSIS

Many instructional designers proceed in a vacuum, attempting to write objectives without first conducting task analysis. The first question for many at this point is "what is task analysis?" The following example serves to clarify a definition and concept of task analysis.

In 1961 President John F. Kennedy stated a goal of his administration. He said, "Let it be our goal that before this decade is out, we will send a man to the moon and return him safely to the Earth." With this goal statement and the commitment to carry it out, a systematic process was set in motion which can serve as a model for instructional design. Applying general systems theory principles, designers begin by deciding what tasks must be done in order to achieve a specific goal. This process is called task analysis.

Before continuing with the example, the concept of "closeness of fit" needs to be developed. To illustrate this concept, pretend that you live in the middle 1800s and that you are driving a covered wagon in a wagon train heading west. Along the way, miles from civilization, a wheel comes off your wagon. With primitive tools and crude resources that you find on the trail, you are able to fashion a wedge to hold the wheel in place until you get a proper replacement part. Now, pretend that you are a helicopter pilot and that after landing in a remote area you discover that the blades are not turning properly. The pin required to hold the blades in position needs to be replaced. Not just any pin will do—it has to be of an exact design and size. The tolerance of diameter on the pin is to 1/10,000 of an inch. The closeness of fit of the repair on the helicopter is much finer and more critical than the closeness of fit on the covered wagon.

What do these examples have to do with instructional design? The purpose of these illustrations is to show that like the wagon driver and helicopter pilot it is sometimes possible for the instructional designer to apply the incorrect "closeness of fit." Sometimes the designer is too coarse in identifying tasks and sometimes the designer is too fine in their identification.

Typically, designers tend to be "too fine" in the application of the principle. As a result, they often list too many tasks to be completed for goal achievement, and even for those tasks that are appropriate to the goal, they tend to be too detailed.

A properly completed task analysis sequences and describes observable, measurable behaviors involved in the performance of tasks that lead to goal achievement. It involves the systematic process of identifying specific and a detailed analysis of each of those tasks in terms of frequency, difficulty and importance.

Now, let us return to the Kennedy goal example. In order to send a man to the moon and return him safely to the earth, millions of tasks had to be completed successfully. But, these tasks were not undertaken randomly; rather, they were organized into categories of major tasks, and at this level, without a lot of detail. They included such tasks as building a rocket powerful enough to break the earth's gravity, building communications systems, and solving environmental problems so as to keep the moon travelers alive. Also, it was necessary to demonstrate that spacecraft could undock, move away from the mother ship, find and re-dock with the host craft. Astronauts had to leave the space vehicle, accurately perform tasks in a near vacuum, and return to the vehicle. Computers had to be designed and built, software programs had to be designed and programmed, and astronauts had to be trained. The effort was organized into three main programs: the Mercury, the Gemini, and the Apollo. None of the tasks or programs described how, in what order, or to what degree the tasks were to be completed. They simply listed the major steps to be accomplished to achieve the goal. The how, when, and how much, are specified in the objectives and activities that devolve from the tasks.

The following are characteristics of tasks:

1. A task has a definite beginning and end.
2. A task is performed in relatively short periods of time.
3. A task is observable. By observing the performance, a definite determination can be made that the task has been performed.
4. Each task is independent of other actions. Tasks are not dependent on components of a procedure. A task is performed by an individual for its own sake.
5. A task statement should not be confused with an objective which has conditions and standards.

Traditional instructional design leans heavily on a behaviorist approach with an emphasis on observable processes. A weakness with this approach is possibility of absence of any allowance for cognitive processes such as hypothesis formation, judgments and problem solving. One of the outcomes of the traditional approach to instructional design then is that the instruction itself cannot develop those abilities, and these abilities are often what differentiate the novice from the expert. Cognitive psychology research offers an effective alternative when we seek to teach people toward expertise. To apply cognitive research places new demands on the instructional designer. No longer is a straightforward account of observed behavior sufficient to analyze a task. The designer must understand the underlying knowledge base and the ways that the experts represent that knowledge internally. This understanding requires a sophisticated task analysis incorporating the domain experts into the design process to extract not only the problem-solving sequence, but also the thinking behind it. Transfer of learning through diagnosing a problem is extremely important, yet transferring that ability to others is a great instructional challenge.

The most important question that an instructional designer can ask upon completion of a task analysis is "If all these tasks are accomplished, will the goal have been achieved?" If the answer is "no" then obviously more work needs to be done. The design should have all the tasks required for goal achievement—no more and no fewer. Other questions to ask are "are any of the tasks superfluous?" "Are all tasks required?" "Are any of the tasks redundant?" "Are the tasks written at the highest level possible (within Bloom's Taxonomy)?" "Do the tasks need to be sequenced?"

Remember that you are working within an emerging system. It probably will be necessary to modify your design as you proceed. For example, you may discover later that you need to add, delete, or re-sequence tasks. Or, you may need to re-visit the tasks upon learning more about Bloom's Taxonomy.

A tendency of many instructional designers, especially novice ones, is to confuse tasks with objectives. It is true that tasks are the foundation of objectives. Objectives devolve from tasks.

## OPERATIONAL OBJECTIVES

Tasks, when completed, lead to goal achievement. A goal is written from the point of view of the learner. All objectives are written, all media are selected, designed, or produced, and appropriate learner practices are planned for one main purpose—goal achievement by the learner. Achievement of the objectives is the evidence that the goals have been achieved and results in validation of the learning events.

Objectives, like goals, must be stated in terms of learner behavior, not in terms of teacher behavior. In other words, what behaviors the learner will exhibit as a result of the instruction, not what of instructional practices and strategies the teacher will follow. It is likely that many persons following the process described herein will have had some experience writing lesson plans. Typically, lesson plans are written from the point of view of the instructor/teacher. That is, what is the teacher going to do, not what the learner is going to do. For example, a lesson plan might include a list of teacher activities such as assigning an in-class activity, distributing a handout, and asking a series of questions of the learners. An instructional design does not describe teacher behavior—it describes learner behavior. As instructional designers proceed through the process, they should filter the design through the question, "Does this describe teacher behavior or learner behavior?" and then conform the design as appropriate.

Unlike goals, which state the exact aim, purpose, or end to any course of action and which can be described in broad terms, and unlike tasks, which identify learner activities that lead to goal achievement, objectives must be stated operationally; that is, in terms of learner performance. No guidance is given with tasks. The tasks have not yet specified a terminal behavior, a condition under which the behavior will manifest, or a standard denoting an acceptable level or degree of performance. The terminal behaviors specified within the objectives must be observable, or the product of observable behavior.

Often instructional technologists write objectives for "lesson plans" that are not operational. Ambiguous terms, such as "to know," "to understand," "to appreciate," and even "to really know," constitute "behaviors" called for in these types of objectives. Obviously, while most would agree that these "conditions" are desirable, agreement of meaning among teachers and learners is almost impossible. Removing ambiguity of meaning is a primary consideration in writing objectives. Examples of acceptable terms are given later in this chapter.

Learners should be knowledgeable of what they are expected to learn. Once learners know precisely that which is expected of them, the teacher's job, as well as the learner's job, is made easier. Too often, teachers themselves cannot describe what is expected of learners except in vague, non-behavioral terms which are interpreted differently each time they are considered. For the teacher alone to know precise behaviors expected of learners is counter to the process; the objectives are written in learner terms, not teacher terms. A common misconception held by many teachers is that learners are not supposed to know that which is expected of them; to do so is "teaching to the test," and is considered by them to be unethical. The result is that most learners within such a system, as well as the teachers, are confused, validation of the success of the instruction is impossible, and any learning that occurs does so by chance rather than by design.

All of the objectives necessary to goal achievement are written at the same time. Remember that although in an emerging systems concept, goals and/or objectives can be added, deleted, or modified through feedback at any point in the process, initially all objectives are written. With the traditional "lesson plan" technique all elements of the "learning event" are written at the same time; for example, an objective is written, and then an instructional strategy is selected, media are selected, and so on. Usually the objectives written under these conditions are written in terms of teacher behavior rather than learner behavior, objectives are not operational, media are considered as "aids," and no appropriate practices are designed. The "lesson plan" technique easily degenerates into a system of organizing materials with no implicit direction for their utilization and with no evaluation process to determine the effectiveness of instruction.

One can easily judge, after having written all the objectives in the module, whether achievement of them will lead to goal achievement. If so, one is ready to proceed to the next task; if not, then the goal must be modified, or the objectives must be modified, deleted, or added until the goal(s) can be achieved.

A common experience for many beginning instructional designers is to become overwhelmed by the seemingly infinite number of objectives that can be written. Indeed, at this point, many persons feel like throwing up their hands in surrender. In the earlier history of "behavioral objectives" they were seen as an end unto themselves. Behavioral objectives were perceived by many as a magical panacea for the ills of education. As a result, curriculum designers and classroom teachers spent a great deal of time and effort in writing behavioral objectives. They usually found themselves concentrating on lower level objectives, and writing great numbers of them. They failed to consider the holistic perspective, that the objectives are effective only in relation to the other elements of learning event design. They failed to acknowledge that there is so much to be learned that they had to arrange a priority of objectives. Most of the objectives they had spent so much time writing and refining were just not important. They were trivial, or when they had content merit, were written on too low a level. They would have been much better served to write considerably fewer objectives, at a higher level, and within the holistic perspective of the superstructure. As a result, many designers had unpleasant experiences and even today they resist the concept of the operational objective.

## Characteristics of Operational Objectives

All operational objectives contain terminal behaviors, conditions and standards. The terminal behavior is the component of the objective, which describes the behavior of the learner after instruction. When learning takes place, the learner is somehow different than he was before the instruction. Remember the definition of learning: a desired behavioral change that is relatively stable over a relatively extended period of time and is void of undesirable side effects. Remember also that the terminal behavior must be observable, or the product of an observable behavior, for it is only then that we can verify the success of the instruction and provide practices appropriate to the solicited behaviors. With non-performance based terminal behaviors, agreement of interpretations between and among teachers and learners, and among these groups, is impossible. The general non-behavioral terms that are frequently used include "to know," "to understand," "to gain insight into," "to become familiar with," and so on. These descriptors demonstrate the ambiguity found in objectives of this type. The use of action verbs, such as "to demonstrate," "to order or arrange," "to erect," and so on, remove ambiguity. With a little additional research the following list of examples can be greatly expanded easily.

| *Ambiguous Action* | *Performance Based* |
|---|---|
| know | adjust |
| understand | choose |
| determine | assemble |
| appreciate | adjust |
| grasp | discriminate |
| become familiar with | solve |
| really understand | apply |
| expose | align |
|  | list |
|  | synthesize |

## Taxonomy

When learning occurs, learners behave differently than before the instruction. In order to specify, in advance those behaviors that are desired, and in order to know when the behaviors have been learned, we need a taxonomy or an orderly classification of learning according to the natural interrelationships of its components. The taxonomy generally accepted by educators was first conceptualized by a group of college examiners attending the American Psychological Association Convention in Boston in 1948. The key participant among the examiners was Benjamin Bloom and the ensuing taxonomy bears his name: Bloom's Taxonomy. Other participants and key figures include Max Engelbart, Edward Furst, Walker Hill, and David Krathwohl, among others. These participants constructed a taxonomy of learning consisting of three major parts: psychomotor, cognitive, and affective domains.

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1. Cognitive Domain of Learning: the development of intellectual abilities and problem solving tasks.
2. Psychomotor Domain of Learning: the development of manipulative or motor skills.
3. Affective Domain of Learning: the development of interests, attitudes, values, and appreciations; in general, the emotional overtone.

## Cognitive Domain

Each of the domains is further divided into levels. Within the cognitive domain of learning, in ascending order of sophistication, we find:

1. Knowledge (emphasizes the psychological processes of remembering; recall; stimulus-response). Knowledge represents the most elementary level of all the intellectual skills. This level includes skills that explain or translate, or communicate literally written ideas in oral language. Some behaviors at this level are tell, memorize, describe, recall, make a list of, repeat, and reproduce.
2. Comprehension (emphasizes the mental processes of organizing and re-organizing information for the purpose of interpretation). Comprehension represents those skills that serve to establish relationships between dates, principles, generalizations, or values. Some behaviors at this level are show the relationship of, characterize, associate, differentiate, classify, distinguish, compare, and categorize.
3. Application (emphasizes the use of abstractions in specific situations). Application represents the skills whose functions facilitate transfer; the application of experiences already acquired to new situations or new relationships. Some behaviors at this level are apply, systematize, experiment, practice, exercise, utilize, and organize.
4. Analysis (emphasizes breaking the abstractions into parts for purposes of clarifying the information). Analysis represents a more complex level of judging or valuing a point of view. Some behaviors at this level are analyze, investigate, discover, determine, observe, and examine.
5. Synthesis (emphasizes the putting together of results of analyses in a way to form a new whole). Synthesis represents the ability to create new and personal forms of expression and reasoning. Originality and creativity are a part of synthesis. Some of the behaviors at this level are synthesize, imagine, conceive, ideate, conclude, summarize, create, invent, construct, and theorize.

| **Knowledge** | **Comprehension** | **Application** | **Analysis** | **Synthesis** | **Evaluation** |
|---|---|---|---|---|---|
| (Ability to recall) | (Ability to comprehend what is being communicated and make use of the idea without relating it to other ideas or material, or seeing fullest meaning) | (Ability to use principles, ideas, theories in new situations) | (Ability to break communication into parts in order to make it clear) | (Ability to put together parts and elements into a new whole) | (Ability to judge the value of ideas, procedures, methods) |
| | | | | | Requires Synthesis |
| | | | | Requires Analysis | Requries Analysis |
| | | | Requires Application | Requires Application | Requries Application |
| | | Requires Comprehension | Requires Comprehension | Requires Comprehension | Requires Comprehension |
| | Requires Knowledge | Requires Knowledge | Requires Knowledge | Requires Knowledge | Requires Knowledge |

Figure 1.4. Levels of cognitive thinking.

6. Evaluation (emphasizes the judgment of the value of information against agreed upon criteria). Evaluation represents the highest level of skill in the hierarchy. The learner utilizes methods, materials, ideas, values, and techniques for learning how to learn. He draws conclusions based on his ability to utilize all of these skills. Some behaviors at this level are calculate, estimate, consult, judge, criticize, measure, decide, accept/reject, discuss, and value.

## Affective Domain

Within the affective domain, in ascending order, are the following levels:

1. Receiving level (notes the learner's awareness of, willingness to receive, and submission of controlled attention to a learning stimulus). In other words, the learner must be aware of the learning task, be willing to receive the study, and in fact, be willing to submit controlled attention to the task (overt action).
2. Responding level (notes the learner's acquiescence, willingness, and satisfaction in responding to a learning task).
3. Valuing level (notes the learner's acceptance of a value, preference for a value, and a commitment to a value).
4. Organization level (notes the learner's ability to conceptualize a value and to organize a value system by bringing together a complex of values).
5. Value complex level (notes the level of internalization of one's beliefs, ideas, and attitudes into a total philosophy within which the learner's behavior is characterized).

## Psychomotor Domain

Within the psychomotor domain, in ascending order of sophistication, are the following levels:

1. Perception (the first step in performing a motor act). Perception is the process of becoming aware of sensory stimuli and is basic in the situation/interpretation/action for motor activity. The level has been divided into three sub-levels: sensory stimulation, cue selection, and translation (determining meanings of cues).
2. Set (notes readiness for action). Three aspects of readiness have been identified: mental set (discrimination/judgment in making distinctions), physical set (readiness of having made anatomical adjust-

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| Receiving | Responding | Valuing | Organization | Value Complex |
|---|---|---|---|---|
| (Awareness of, willingness to receive, submission of controlled attention to learning stimulus) | (Acquiencse, willingness, and satisfaction in rewspond- to a learning task) | (Acceptance of a value, preference of a value, and commitment to a value) | (Ability to conceptualize a value and to organize a value system) | (The level of internalization of one's beliefs, ideas, and attitudes into a total philosophy within which the learner's behavior can be characterized) |
| | | | | Requires Organization |
| | | | Requires Valuing | Requires Valuing |
| | | Requires Responding | Requires Responding | Requries Responding |
| | Requires Receiving | Requires Receiving | Requires Receiving | Requires Receiving |

Figure 1.5. Levels of effective activity.

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ments for motor activity), and emotional set (readiness in terms of attitudes favorable to the desired motor act).

3. Guided response (an early step in the development of skill). Two major sub-categories exist here: imitation and trial and error.
4. Mechanism (indicates a level of confidence and a high degree of proficiency).
5. Complex overt response (the act can be carried out smoothly and efficiently). The act is performed without hesitancy and is considered automatic in nature. An example would be playing the violin.
6. Adaptation (altering motor activities to meet the demands of new situations requiring motor response).
7. Origination (creating new motor acts out of skills developed in the psychomotor area). An example would be an innovative routine on the parallel bars used by a gymnast.

Using Bloom's Taxonomy, we are now able to write operational objectives to a pre-determined level, and to classify previously written objectives. Due to the phenomenon that there is so much to learn that we have to be selective in what we ask learners to learn (economy of effort), it generally is to our advantage to write fewer objectives, and to write them on a higher level of sophistication. Many instructional technologists' past experience include frustrations of writing many, many lower level objectives, and becoming bogged down to the point that the intent of the goal is lost. The experience has often been such a negative one that today these designers have an aversion to writing objectives. However, if the instructional designer writes fewer objectives, keeps them on a higher level, and relates them more directly to the goal by operationalizing tasks, the experience will be more rewarding.

## Perspective

Learning, by its definition, demands an overt response (behavior) from the learner. One demands this in the design by saying that the terminal behavior is observable, or is the product of an observable behavior, such as a painting, short story, a research paper, and so on. Before one can exhibit an observable behavior or its product it is first necessary to INTERNALIZE a set of cognitions, attitudes, and psychomotor skills in order to then EXTERNALIZE (from these cognitions, attitudes, and psychomotor skills) an observable behavior or its product. The externalization is the proof that the desired behavior has been learned. Often, ineffective teaching and learning allow for and encourage only internalization. Only through externalization is there evidence of learning. The model in Figure 1.7 provides an example of the internalization/externalization mode.

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| Perception | Set | Guided Response | Mechanism | Complex Overt Response | Adaptation | Origination |
|---|---|---|---|---|---|---|
| (Becoming aware of sensory stimuli and is basic for motor activity) | (Notes readiness for action thru mental, physical and emotional set) | (Initiation and trial and error) | (Levels of confidence and a high degree of proficiency) | (Performance without hesitancy and is automatic) | (Altering motor activities to meet the demands of new situations) | (Creating motor acts out of skills developed in psychomotor area) |
| | | | | | | Requires Adaptation |
| | | | | | Requires Complex Overt Response | Requires Complex Overt Response |
| | | | | Requires Mechanism | Requires Mechanism | Requires Mechanism |
| | | | Requires Guided Response | Requires Guided Response | Requires Guided Response | Requires Guided Response |
| | | Requires Set | Requires Set | Requires Set | Requires Set | Requires Set |
| | Requires Perception | Requires Perception | Requires Perception | Requires Perception | Requries Perception | Requires Perception |

Figure 1.6. Levels of psychomotor activity.

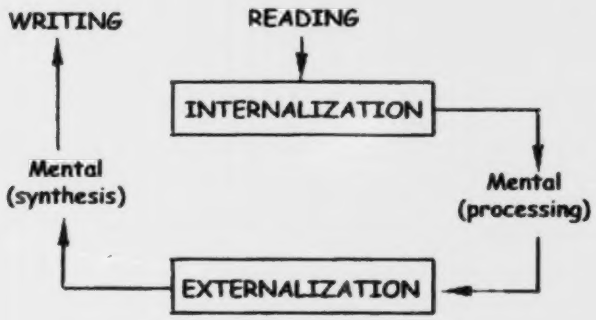
WRITING
READING
INTERNALIZATION
Mental
(synthesis)
Mental
(processing)
EXTERNALIZATION

Figure 1.7. Internalization: Externalization

Examples of internalization include:

1. Reading
2. Observing
3. Listening
4. Tasting
5. Smelling
6. Touching
7. Watching
8. Memorizing
9. Imagining
10. Thinking

Examples of externalization include:

1. Writing, editing, outlining, taking notes,
2. Creating, constructing
3. Painting, drawing, lettering
4. Graphing, charting, mapping
5. Photographing, recording
6. Experimenting, researching
7. Collecting, exchanging
8. Traveling
9. Displaying, exhibiting
10. Demonstrating, showing
11. Dramatizing
12. Playing games, simulations
13. Dancing, choreographing, singing

14. Organizing, summarizing
15. Composing
16. Computing
17. Judging, evaluating
18. Working

So, a higher level objective which allows externalization is built upon internalization. Internalization tasks usually are best considered prerequisites to be learned before the learner practices the terminal behavior.

Objectives that allow the learner to function on a higher level require the mastery of the lower levels within the taxonomy. For example, for a learner to synthesize a higher level function, it is usually necessary for him to acquire "knowledge" of facts, comprehend their meanings, make appropriate analyses and applications of the knowledge and comprehension before he can generate synthesis. More specifically, knowledge and comprehension of several instances in American history related to civil disobedience can lead one to synthesize that "massacres" are inherent with civil disobedience (Boston Massacre, Kent State Massacre, etc.). Too often, the objective is written on the lower level, not only disallowing the higher cognitive function, but also discouraging it. A more sophisticated design will allow these lower levels to be acquired through appropriate practices (and pre-requisite tasks) and need to be alluded to here. The lower level objectives which we have written in the past are best utilized as pre-requisite tasks which will be covered in the chapter on appropriate practices.

Operational objectives contain:

1. A terminal behavior describing the behavior of the learner after instruction,
2. Conditions which describe the situation in which the learner will be required to demonstrate the terminal behavior,
3. Standards which describe the minimal level of performance will be accepted as evidence that the learner has achieved objective.

Types of Conditions:

1. Tools. Calculators, books, models, realia, and so on.
2. Restrictions. On time, on senses (such as blindfolded), and so on.
3. Presentational mode. In writing, orally, demonstrating psychomotor skills, creative endeavors (such as slide/tape presentations, transparencies, scripts, songs, etc.).

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Types of Standards:

1. Occurrence. (e.g., The driver will use hand signals before all turns).
2. Accuracy. (e.g., The answer must be correct to the nearest whole number).
3. Errors. (e.g., With a maximum of one error).
4. Time/speed. (e.g., Within five seconds).
5. Known reference. (e.g., perform the sequence of steps in the same order as the training manual states).
6. Consequences. (e.g., Block the defensive tackle long enough so the quarterback has at least three seconds to throw the pass).

Following are examples of objectives containing all of the elements of an operational objective.

1. Using filmstrip production equipment and materials (condition) the learner will produce a filmstrip (terminal behavior) which illustrates the use of metaphor, simile, personification, and symbolism (standard).
2. While working in small groups (condition), the learner will choose, plan, and record a supernatural poem (terminal behavior) using suitable music and sound effects as a background (standard).
3. Using discarded magazines, newspapers and realia, (condition) the learner will examine his own ideas by collecting pictures, words, and statements representative of his life and his personality (terminal behavior) and by making a collage (with his picture in the center) (standard).

Figure 1.8 displays the learning event design form.

In addition to leading to goal achievement, operational objectives make it possible to develop experiences for the learner to practice the terminal behavior called for in the objective. They also make it possible to select, procure, plan/produce appropriate media, and make it possible to design criterion checks to validate the success of the instruction.

**GOAL:**

**TASK:**

| **OBJECTIVE:** | **LEARNER ACTIVITIES:** | **MEDIA:** | **CRITERION CHECKS:** |
|---|---|---|---|

Figure 1.8. Display format for instructional design.

## LEARNER ACTIVITIES

Goals are stated after a rigorous process of studying the sources of student, society, and subject and after screening preliminary goals written from these sources through a philosophy of teaching/learning and a psychology of teaching/learning. Goals are analyzed and a list of tasks necessary to goal achievement is developed. These tasks are carefully studied in relation to the goal to assure that all tasks necessary to goal achievement are included, and that no tasks are redundant or superfluous. Since this instructional design is within an emerging system philosophy, modifications can be made at any time, on any part of the design so long as they are appropriate without jeopardizing the integrity of the design. Once the scrutiny is completed, the tasks are operationalized, that is, they are converted to objectives by specifying a terminal behavior, the conditions under which these behaviors are to manifest, and a standard, or acceptable level of performance. This goal, the tasks, the operational objectives (to include terminal behaviors, conditions, and standards) should not be dictated by either the instructor or the student, but should be negotiated. In doing so, the design takes on a characteristic of any system—decentralization. Achievement of objectives is evidence that the goal has been achieved.

Both goals and objectives are written from the perspective of the learner; that is, learner behavior is indicated, not teacher behavior. This is a major distinction between an instructional design and a lesson plan. Anyone who has been through a teacher education program at an undergraduate level has had instruction and practice in writing lesson plans. A lesson plan typically contains strategy for the teacher, from the teacher's point of view, about the instructional process. In an instructional design, the plan is written from the learner's point of view, that is, what is the learner going to do, not what the teacher is going to do.

Objectives have three components:

1. A terminal behavior which states explicitly what the learner is to learn as a result of the instruction; ambiguity has been removed in that an overt verb describing the behavior is used to describe the learning, or a product is generated which provides evidence that the goal has been achieved
2. The conditions under which the behavior or product will manifest, and
3. A standard which states, a minimally acceptable level of performance, at least, and a level of excellence, more desirably.

It may be good to remember at this point that the difference between mediocrity and excellence is attention to detail. A learner who is encouraged through the design to pay attention to detail will move toward excellence.

To determine whether learners have achieved a given objective, they must be expected to perform the terminal behavior under the conditions and to the standards stated within the objective. It is critical that the learner be provided appropriate media, that the environment be arranged, and that the learner be allowed to practice the behaviors, under the conditions, and to the standards before being accountable for exhibiting those behaviors. It is not uncommon for a teacher to test that which was not taught. A teacher once said, "I teach my students how to do stated mathematical problems, but to really test their knowledge, I test them with written problems."

Bloom's Taxonomy, an orderly classification of learning that gives instructional designers a superstructure within which to ply their trade, contains six levels within the cognitive domain, five levels within the affective domain, and seven levels within the psychomotor domain. The cognitive domain is generally divided by designers into two levels: lower levels and higher levels. Lower cognitive levels are generally considered to be knowledge, compression, and application while higher levels are considered to be analysis, synthesis, and evaluation.

Earlier, we noted that teachers/trainers, and some instructional designers, more often write objectives on the lower levels within the cognitive domain. Consider this example from an American history class: Learners read a passage in a text, and then answer a series of questions about what they read; the "learning event" then concludes at this point when in most instances this is the level at which learning should begin. In fact, this type

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of practice can be considered pre-requisite to learning that is to occur later through an objective stated on a higher level. While the described activity in the example can be appropriate in some instances, it usually is inappropriate and its occurrence is far too common. In fact, teachers too often write objectives only on the lower levels, especially at the knowledge level within the cognitive domain. The learning event should begin at this point—not end. A reminder that by operationalizing the tasks leading to goal achievement, an instructional designer will by necessity write fewer objectives (the design will have the same number of objectives as it has tasks) and the objectives will be at a higher level than they otherwise would be. These higher level objectives will require the knowledge, skills, and attitudes contained within the lower levels. For example, if an objective is written at the synthesis level, its achievement will require knowledge, comprehension, application, and analysis before it can be achieved. These learner activities must conform to the appropriate level. For example, before learners can achieve an objective at the synthesis level, they must:

1. Assimilate a body of knowledge. They can gain knowledge by a variety of activities. They can read from teacher selected and learner selected printed materials. They can view filmstrips, slides, films, and videos. They can listen to records and tapes. They can surf the World Wide Web. The media and activities available to accumulate knowledge are almost limitless. Delivery systems make information available at a speed and degree that most previous teacher/trainers did not envision. Sadly, too many critics of education consider this level the end of the process rather than the beginning. Before any of the higher levels can be achieved at a level of excellence, the learner must proceed though the hierarchy, in order.
2. Once a requisite knowledge level has been attained, the learning activities should include opportunities to comprehend the knowledge. It is not necessary to relate this knowledge to other ideas or materials at this point, or to see its fullest meaning. These functions come at higher levels.
3. Application requires the learner to use ideas, principles, and theories in new situations. Application requires comprehension.
4. In the higher cognitive levels, analysis activities require the learners to break knowledge into parts in order to make it clear. Analysis requires knowledge, comprehension, and application.
5. Synthesis requires the learner to put together the elements of analysis into a new whole.
6. Evaluation requires the learner to judge the values, procedures, and methods contained within the synthesis.

## THE ROLE OF MEDIA

Since the process of communication is an integral component of teaching and learning, all teachers utilize forms of media in the teaching/learning process. The media they use range in sophistication analogous to the levels of the sophistication of use of goals and objectives. Media can be anything which transmits a message from a source (sender) to a learner (receiver). Media can be books, pamphlets, brochures, and handouts; they can be slides, filmstrips, and motion pictures; they can be television, calculators, and computers; and they can be hand gesticulations, body movements, or even a sparkle in the eye. Media can be as simple as hand gesticulations, or as complex as multi-image/multi-media. Regardless of their form, certainties exist that affect their selection, design, production, and use. For example, media are inert; they are incapable through simple existence, of facilitating learning. You can have the newest, biggest, shiniest, prettiest, costliest, and finest collection of media in one place and still have a pile of bricks for instructional purposes. Media are only effective when they are used for the purpose for which they were intended, for whom they were intended, and under the conditions for which they were intended. Regardless, media must be present and used appropriately for learning to occur.

Learning can be defined as a desired behavioral change that is relatively stable over a relatively stable period of time and that is void of undesirable side effects. Learning, by definition, requires communication, that is, learning requires something to learn (a message), someone to learn it (a learner), and the message is transmitted to the learner from a source (a sender), and via a medium. What we have just described, communication, is a system. A reminder, that in general systems theory, no subsystem is more important that any other subsystem—all are equally important. In systems, if a subsystem is not present, fails to function, or functions improperly, the whole system will probably fail, or a least function at an undesirable level. So, media must be used for learning to occur. Instructional designers, and good teachers, do not use a medium simply because it is available. They certainly do not consider media to be an audiovisual aid. If something is an aid, it can easily be considered superfluous, a frill or a gimmick. Good teachers and instructional designers use a given medium because it is the best, or necessary, for a given learning event.

Media, as a component of the Model for Instructional Design being used in this book, is part of the critical path in the process (see Figure 1.1). The component acts also as a member of the triad Operational Objectives/Learner Activities/Media (see Figure 1.2). These three elements interact closely. Learner activities are selected at least partially on the basis of the availability/producability/suitability of certain media; media are selected/designed/procured/produced on the basis of the need, stated or implied, in the learner activities and of the need present in the operational objective.

No medium can be considered to be "best" in all situations. One cannot safely assume that motion pictures are better than television, or that slides are better than filmstrips, or that computers (World Wide Web) are better than a textbook for instructional purposes. Media have characteristics which preclude their use under certain conditions and which also might mandate their use under other conditions. Added to this phenomenon is the characteristics profile of the learner. The learner has characteristics which preclude, or suggest, use of a specific medium. Also, the characteristics of the objective (terminal behavior, conditions, and standards) as well as the learner activities affect the choice of media to be used in a specific learning requirement.

## PROCURING MEDIA

Once you have determined the medium for instruction, then you are faced with the task of selecting the appropriate software. As the specificity of the message increases and as the requirements of the learner become more sophisticated, you will be less likely to find the software commercially available. Regardless, it is suggested that the following four steps should be considered in the order in which they appear.

1. **Borrow**. As other conditions are equal, you will find it less expensive and to your obvious advantage to borrow the media. Sources for borrowing include: Educators Guide to Free Films, Educators Guide to Free Filmstrips (both published by Educators Progress Service, Inc., Randolph, Wisconsin; the editors have searched out thousands of free films and filmstrips and provided information about them in this valuable guide), regional service centers, interest groups, governmental agencies (such as the National Aeronautics and Space Administration-NASA), business and industry (Bell Telephone, for example), and societies such as The American Cancer Society and the American Heart Association. Your school Library Media Center, your regional service center, or your local public library may have what you need already in its collection. Never base your learning event simply on availability of media—find the medium to suit the event, not the other way around.
2. **Rent**. If your efforts to find the software from free sources has been unsuccessful, then your next effort should be directed toward renting the medium from a rental library. Many rental libraries exist; the number is too great to provide an exhaustive list here; however,

some of the larger libraries are Audio-Visual Center, Indiana University, Iowa Film and Video(Iowa State and Iowa University), Audiovisual Center Film and Video Library at the University of Wisconsin-LaCrosse, and this list is by no means complete. Your library should have several catalogs from which to select. You will find that in most instances media rentals are surprisingly inexpensive. The R.R. Bowker Company has published The Educational Film and Video Locator, a reference which lists films and videos by title, a description of the film or video including a synopsis, and for most entries several sources for rental. Your library media specialist is a valuable resource in helping you locate rental media in any format.

3. **Buy**. If the media cannot be borrowed or rented, then you should purchase it if it is commercially available. You will find, however, that in many instances it will be cheaper to rent the software rather than purchase it. An exception would be when your anticipated usage over a specified period of time would cost more to rent than to purchase. For example, to rent a film from the Audio-visual Center, Indiana University, might cost you $15.00 per three day rental. Over a period of five years you anticipate using the film 15 times for a total cost of $225.00. To purchase the film may only cost $200.00, resulting in an immediate savings of $25.00, plus a great savings in time and effort in not having to complete the paperwork necessary for rental, not to mention the handiness of owning.
4. **Produce**. If the media are not commercially available (does not exist), then you should produce it, either locally (in-house) or on a contractual basis. In fact, the more specific and unique the learning event, the less likely you will be to find the software commercially available. A good explanation for this is that producers/distributors often feel that they are limiting their market by producing media for a limited use.

An indispensable source used for determining that media are available either for rental or purchase is the NICEM Index. The NICEM Index, published by the National Information Center for Educational Media, University of Southern California, is a multi-volume work containing information about non-book media. It is now available on-line or on CD. Volumes in the series include indexes to 16mm educational films, 35mm filmstrips, 35mm slides, audio tapes, video tapes, transparencies, records, 8mm motion picture cartridges, CD's, and a guide to producers and distributors, among others. NICEM provides information ABOUT media; it does not rent or sell the software

Chapter 4 of this book, Principles of Layout and Design, presents an in-depth rationale and plan for the design and production of instructional media.

The foundation of professionalism is accountability. Accountability means that when specific professionals are afforded environments, materials, pertinent personnel, and adequate amounts of time, they are able to produce the product expected by a sponsoring society and a profession that declares itself to be self-regulating. Accountability is possible, at appropriate levels of quality and significant levels of confidence, only when the techniques, the processes, and the media, designed to generate the product intended, are validated. Validation means only that whatever is presumed to be validated works, confidently, however it is supposed to work with whomever it is supposed to work. Obviously, this kind of validation implies that no single technique, process, or medium is likely to be an omnibus, nor omniscient, nor omnipotent. Therefore, whatever works, works for whom it works. For whomever the technique, the process, or the medium does not work, the obligation is revision to suit, until it does work.

## OVERVIEW

Public education is supported by a sponsoring society. The sponsoring society pays taxes for which they expect certain specific, positive results. It is expected, within a tax-supported system of public education that all participants will succeed to the extent of the limits of the personal capacity of each. When all of the youth of a given society do succeed, the professionals, the techniques, the processes, and the media can be said to have met standards of accountability. When any technique, process, or medium accomplish what was predicted it can be said to be validated. Except for those whose pathological, psychological, or physiological conditions require highly trained, licensed specialists, each participant should expect from regular instructional design the kind of learning experience that works for him.

It is not uncommon to find in the statements of philosophy of school systems the declaration that each participant has worth, dignity, and uniqueness in his needs and differences. Oftentimes all the participants are instructed in the same way. In many schools and school systems, all of the participants are subjected to similar, possibly even the same, evaluation methods and media. In many schools, participants declared unique are graded mainly in comparison to other participants rather than in relation to their accomplishment of unambiguous criteria or in relation to cognitive, affective, or psychomotor development from the beginning of a learning experience to the end.

## GRADE INFLATION

Periodically, the clangor of a tocsin warning against artificial grade inflation resounds through the wonderland of education. The alarm would be more authentic if it warned against irresponsibility and deprecation of academic product. Apparently, there are those in the profession who really do not comprehend the nature or process of evaluation.

There are those supervising professionals who doubt, secretly, that any instructor can really be too successful. They believe that interaction between instruction and learning is weighted on the side of learning and that instruction is the lesser necessity. They believe that every class is a randomized, equated, cross-section sample of society. They cannot believe the genuine success of all learners at given levels of criteria.

To the doubter high grades are seen as a skew towards success, indicating at best remarkable luck, or "teaching to the test instructing to the means of evaluation, or "teaching to the test," is generally viewed as cheating or, at least, as not playing fair.

On the other hand, it is well to consider the following:

1. The objectives should be found in the evaluation criteria.
2. Whatever is important should be in the evaluation.
3. Whatever is unimportant would not be in the evaluation, if the evaluator capable, and how to get it done.

## PEDAGOGICAL PROGRESS

Since the beginning of human history, mankind has been instructing his young. The process was refined very little until the Gutenberg press began to produce printed matter economically. History has been recorded systematically for about 2500 years. In 2500 years we have achieved significant development in academic content and technology. One might also expect that similar development has been made in pedagogy during the same period, but it has not.

Mankind has been instructing his young at least as long as he has been recording history. We might expect that modern education might produce better results. Instead society is riddled with functional illiterates who have passed through contemporary schools.

Grades are signs used to display various degrees of success. When a professional knows what he intends and how to achieve what he intends, when the learner knows what he is supposed to learn and can improve it under specified conditions, then grades will represent that success in teaching and learning.

Supervisors seem to be disturbed less when grade scores are arranged to conform closely to a curve of normal probability. When grade scores clump towards the high end of the tail of the curve, supervisors sometimes say the following:

4. Standards of instruction are not high enough, or
5. The instructor is "too easy", or
6. The instructor does not know how to test.

When grade scores clump towards the lower end of the tail of the curve, supervisors sometimes say the following:

7. The instructor is demanding, or
8. The instructor is "incompetent", or
9. The instructor did not test what he instructed, or
10. The instructor did not instruct what he tested, or
11. The instructor does not know how to construct a test.

In any case, a set of scores from the usual class is unlikely to conform to the curve of normal probability. The scores can be forced, that is adjusted, that is treated, so that they do conform, more or less, but the bias distorts the mathematics to a meaningless hodgepodge that has shape without substance. When instructors attempt to "adjust" the scores, it becomes an exercise in camouflage.

## Normal Probability

To be valuable for its intended purpose, the law and the curve normal probability must function within its own characteristics as follows:

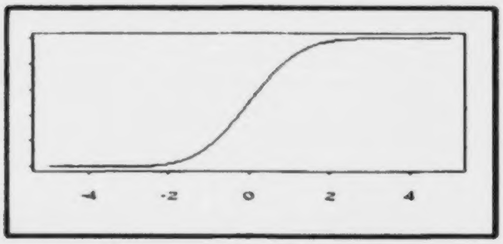
1. The data from which the distributions are made must result from a measurement that is valid; that is, it measures what it purports to measure.
2. The measurements that produce the data must be reliable; that is, they measure what they are supposed to measure consistently, time after time.
3. A significantly large population must be used from which to obtain the data.
4. The large population must represent a sample that is a randomly selected and is a cross-section of the society of which it is a part.
5. Data are the result of influential variables.

6. Intervening variables are recognized, eliminated, or controlled, or their effects are accounted for.
7. It can be demonstrated that similar data can be generated naturally with similar populations when conditions are similar.
8. The degree of standard error is known and taken into account during interpretation of the data.
9. No artificial means are used to contrive the conformance of the data to the ideal shape of the curve that symbolizes normality.

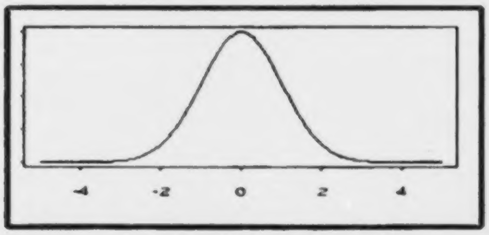
Ideally, what goes on as treatment in the institutions of instruction is not at random. Ideally, what goes on as instruction is biased in favor of the unique needs and differences of participants. Ideally, in 2500 years, the professionals of instruction have developed techniques on which everyone might rely. Ideally, the element of chance has been minimized and eliminated to a significant degree. Sadly, evidence indicates that these ideals have not been met.

Yet, in public and private institutions of instruction, in training and development of industry and business, too much manpower, time, effort, and money are expended to allow the existence of randomness or chance in instruction. There are too many tenured and certified teachers and too much respect for teacher certification to accept randomness and chance as a modus operandi. Investment in in-service education programs, supervision, and administrative leadership should cancel the curve of normal probability as a reliable expectation. Assuming that professionals are competent, the curve of normal probability should show "normally" a significant skew towards the high tail.

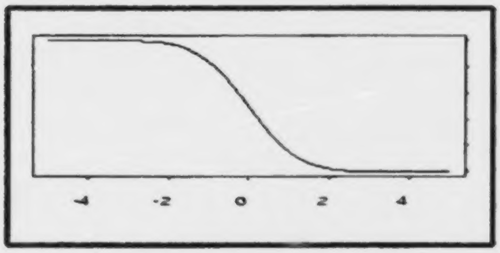
Especially in public education, purported to be for all American youth, normative-referenced evaluation is, when accurately used, appropriate to only a few isolated, unique purposes. Used generally for all evaluation purposes it is a misdirected technique that produces irrelevant results. For worthy, dignified participants whose needs and differences are unique, the technique is malevolent.



**Skew to the High Side**



**Normal Distribution**



**Skew to the Low Side**

Figure 1.9. Distribution curve.

## Bias

Randomness is a key condition to the generalization of data. Bias is introduced when any condition forces selection of any part of an observation, a measurement, means of interpretation of the data from a test, instrument readings, or placement of members in any kind of an audience. Participants in classes of institutions of learning are seldom selected with genuine randomness. Seldom, if ever, are such classes' true samples of populations. Contamination of randomness results frequently when, for one reason or another, benign or practical, one participant or another is moved with design into one group or another, ignoring the table of random numbers or computerized placement.

Bias influences the validity of data. When validity is uncertain, reliability is worthless and generalization is not genuine.

## Bias of Selectivity

The mass media, peer groups, schools, family and home life, social agencies, and religious agencies have been shown by sociological research to have influence on youth. The impact of their influence is in that order. School influences are third in the order of impact on youth and have, by no means, the intensity of the mass media and the peer groups.

Experience becomes increasingly intense and influential as youths become older and form attitudes. Attitudes may be arranged on a scale with the enthusiastic, successful, versatile, self-reliant learner at one end of the continuum, and the physiological and psychological dropouts, depressed, unsuccessful, insecure, and dependent at the other end of the continuum.

History has shown that erosive forces in general society and in schools tend to divert and eliminate youths who find institutions of learning to be punitive, coercive, irrelevant, and unsatisfying. Only the law keeps many participants in attendance at schools. Even the law does not hold all of the participants it might.

Students who experience advanced study or training are truly a selected group. This selected group has survived, at least, the influence of the mass media, peer groups, negative experiences in public or private institutions of learning, family life, social agencies, and religious agencies. They are not cross-sectional, randomized representations of society.

## Subjectivity

Evaluation in most institutions of learning consists of an assessment disclosed by means of a judgment of a product, a performance, an activity, or a test of some sort. Not infrequently, the evaluation is made by subjective comparison of the performance of one participant with the performance of others. Not unusually, some such judgments are tempered by the inclusion of extenuating circumstances, which not only are not extended to all participants, but also not even used consistently with those who benefit by them. Other comparisons are made using data from invalid tests or unreliable tests, and from means that may be beyond the economic ranges of some participants.

Normative-referenced evaluation is appropriate when it is used to discriminate between learners. On the other hand, the purpose of public education is to provide conditions within which each learner can achieve potentials of growth and development related to his characteristics. Adequate application of valid and reliable normative-referenced evaluation depends upon the knowledge and competence of the evaluator in selection of items for the evaluation, skill in writing items when necessary, item analysis, item refinement, and the derivation of known reliability and validity. Contrivance of data manipulation invalidates the curve of normal probability and renders normative-referenced evaluation meaningless to the degree and frequency of the manipulation.

## Validity and Reliability

A normative-referenced test, like any other kind of test, must be valid to be worth anything. A test that is valid is one that tests what it is supposed to test. A test cannot be valid without also being reliable. Reliability means that the same test will provide similar data, confidently, when administered to similar persons under similar conditions. To be respectable, reliability must be expressible in coefficients of .90 or above. A coefficient of .50 means that the test will be reliable only 50% of the time. A reliability coefficient of .90 means that the test will produce reliable results 9 Out of 10 times, or 90 out of 100 times, or any other multiple of ten.

The reliability of a test is determined by any of a variety of statistical means. Reliability analyses often involve item difficulty analyses, and the disclosure of negative and positive discrimination items. When an item discloses itself as a negative discriminator, that is, when low scoring participants succeed in getting the item correctly, and when high scoring participants fail to get the item correctly, the items needs to be replaced.

An unreliable test produces unreliable data. They produce unreliable evaluations of participants. Attempts to equate evaluations with evaluations are equally or more unreliable. When a professional is unaware of reliability, its applications, and its importance, or when the professional insists on using the evaluation in disregard of its characteristics, such use is, at most, a disservice to participants. At worst, it is a dereliction of professional practice.

## Item Writing

At any level, normative-referenced evaluation is composed of items. Item writing is a precisional skill that requires training and practice. There is little about the skill of item writing with which one is born. While literary ability may be helpful, it is of secondary or even tertiary value.

First, item writing is a matter of selecting an appropriate class of items. To evaluate cognitive learning, in any of its several divisions, the item must be cognitively structured within the appropriate division. Similarly, evaluation of affective behavior requires appropriate items to evaluate specified indicator behaviors. In turn, evaluation of a psychomotor behavior requires items that call for psychomotor performance.

Next, item writing, whatever its classification, calls for appropriate use of terms and symbols. Attention must be given to the length of the item, the complexity of its structure, the abstractness of its terminology, and the relative difficulty of semantic decipherability. The item writer must understand and avoid inadvertent clueing, obvious errors, and the use of distracters.

## Discrimination

When an evaluator needs to learn which of a number of participants are most qualified to become members of any criteria charged opportunity, normative-referenced reliable evaluation is the way to get the task done. Normative-referenced reliable evaluation is a respectable technique for discriminating among learners. The consistency of reliability should continue from evaluation to evaluation, group to group, and institution to institution.

Evaluation, based on opinion, and supported only by the judgments of one's expertise, places the decisions made squarely in the realm of the subjective. At best, the judgment may be informal opinion. At worst, the judgments may be purposeful bias.

At least, those who defend subjectivity on the basis of their experience are clear about their intent, though they may not be clear about the validity of their evaluation. There are so many areas of bias, so many intervening variables, and so much error indigenous to the technique that it is not defensible. No persistent data are generated by subjective evaluation, and research has shown that subjective evaluators vary from one participant to another, and even from one time to another with the same participant, and including second evaluations of the same performance by the same participant when the evaluator was not aware he was evaluating the identical performance and performer for the second time.

To suggest that "our evaluation techniques compare favorably with other evaluative techniques used by other instructors in similar institutions in this part of the country" is probably to compare one's techniques with other ineptitude or mediocrity, none of which may be valid or reliable. Yet, the condition to be emphasized is that the evaluations made by instructors in educational institutions end-up on transcripts, and transcripts follow them throughout their academic careers.

## Criterion-Referenced Evaluation

Criterion-referenced evaluation is a viable alternative to normative-referenced evaluation. Since tax-supported public education is for all American youth, the implicit mandate is that all American youth will have opportunities that are appropriate to their unique needs and differences. To accomplish this respectable purpose with system and consistency, criteria for learning, both general and specific, need to be formulated.

Assumptions of criterion-referenced evaluation include the following:

1. The participants in public institutions of learning need learning opportunities designed for them. A great deal of establishment of remediation, of enrichment and of advanced learning is necessary for effective learning.
2. Essential product of public institutions of learning is that participants learn. When participants learn what is expected, the public institution has satisfied the burden of accountability. It is, of course, desirable that participants learn with economy of time, effort, and for them as well as their instructors. Time, however, is basically irrelevant. Participants ought to learn, of course, as much as they are able, as swiftly as they are able, but the process and its intent is to learn and ought to be regardless of time.
3. A course of study consists of arranged experiences. The last experience ought to be as consequential, significant, and relevant as the first. As a gestalt, a pattern of learning is unlikely to be complete until the terminal experience has been concluded. The task analysis conducted early in the design process specifies all the tasks necessary to achieve the goal. None can be eliminated; none should be added. The process is decentralized—no experience based on learning tasks is more important than any other experience. Some participants need more time than others, even to reach general readiness, and certainly to activate and order what they learn into an applicable format. Therefore, artificial, administratively convenient boundaries, such as terms, quarters, semesters, or any other limiter, have no real bearing on learning and ought to be ignored.
4. Participants need to know what they are supposed to learn, under what conditions, what they are supposed to do to demonstrate that they have learned, and what standards are acceptable or excellent. When time limitations are relevant, participants need to know how much, and why.

One of the characteristics of criterion-referenced evaluation is that, disregarding time as a factor when time is not genuinely relevant, all learners can eventually succeed at the higher levels of quality. To those who insist on the curve of normal probability, the skew generated may be untenable. To those who comprehend the mission of public education, there is no other genuine route.

For all learners to succeed eventually at high levels of quality, is a mark of distinction and a condition of the finest kind of educational opportunity. It is also evidence of the highest kind of performance in professional instruction.

Criterion-referenced evaluation is based on the direct, positive, criteria-guided observation of a tangible product. Evaluative criteria, properly constructed, are unambiguous. Evaluation, using criteria, may be diagnostic. Such evaluation is objective and can be applied consistently to all participants.

### Levels

Using criterion-referenced evaluation, there are only three tenable levels of evaluation:

1. The participant has not yet learned.
2. Within the established criteria, the participant has learned acceptably.
3. Within the established criteria, the participant has achieved qualitatively or quantitatively a superiority of learning.

The only limitations on criteria are those designed by a professional instructor. The accountability of a professional is validated when the product is generated by participants within acceptable standards of quality. When participants are unable to accomplish the criteria, the criteria need to be redesigned.

## NORMATIVE-REFERENCED EVALUATION VS. CRITERION-REFERENCED EVALUATION

### Criterion-Referenced Evaluation

Some testers and educators have argued tests should not depend on norm groups (normative-referenced evaluation) but on whether students have mastered specific instructional goals (criterion-referenced evaluation).

The support for criterion-referenced measurement comes primarily from the emphasis on performance objectives, the sequencing and individualization of instruction, and the development of constructivism. This emphasis suggests that almost anybody can learn almost anything if given enough time. They believe that norm referencing promotes unhealthy competition and damages the self-concepts of low-scoring students.

The principal uses of criterion-referenced measurement have been in mastery tests within the classroom; for example, for minimum competency tests for high school graduation, and for licensure tests. A mastery test is a particular type of criterion-referenced test. Mastery, as the word is typically used, connotes an either/or situation. The person has either achieved the objective(s) satisfactorily or has not. Criterion-referenced testing in general could also measure degrees of performance. Mastery tests are used in programs of individualized instruction, such as the Individually Prescribed Instruction (IPI) program or the mastery learning model. These programs are composed of units or modules, usually considered hierarchical, each based on one or more instructional objectives. Each individual is required to work on the unit until he has achieved a specific minimum level of achievement. Then he is considered to have mastered the unit. In such programs instructional decisions about a student are not dependent on how his performance compares to others. If he has performed adequately on the objectives, the decision is to move on the next unit of study. If he has not, then he is required to restudy the material covered by the test until he performs adequately, this masters the material. If instructional procedures were organized so that time is the dimension that varies and degree of mastery is held constant, then mastery tests would be used more frequently than they are now.

Mastery testing requires the tester to set a cut off score. There should be a careful rationale and procedure for choosing that point. No very useful information can be obtained regarding degree of proficiency above or below the cut off score.

A related use of criterion-referencing testing is minimum competency testing. Minimum competency testing is one area where cutting scores are set, and degrees of performance above the cutoff are not considered in making promotion, graduation, or certification decisions. Licensure tests for teachers are considered criterion-referenced. The purpose of a licensure test is to ensure that the public health, safety, and welfare will be protected. Thus, licensure tests are used to help determine whether individuals have minimal competence to practice their profession. Thus, a cutting score must be established. Employing the individually prescribed instruction or mastery model of learning, minimum competency testing and licensure are not the only uses for criterion-referenced measures; such measures may also be used to evaluate instructional programs. In order to determine whether specific instructional treatments or procedures have been successful, it is necessary to have data about the outcomes on the specific objectives the program was designed to teach. A measure comparing students to each other may not present data as effectively as a measure comparing each student's performance to the objective.

Criterion-referenced measurements also offer certain benefits for instructional decision making within the classroom. The diagnosis of specific difficulties accompanied by a prescription of certain instructional treatments is necessary in instruction whether or not the teacher uses a mastery approach to learning. Because criterion-referenced tests are often narrower in scope, there may be enough items on a given objective to make inferences about an individual's general performance on that objective. This assessment cannot typically be done on a traditional norm-referenced test because there are too few items on any specific objective.

## Normative-Referenced Evaluation

Not many learners look forward to taking tests. Whether they are pop-tests, unit quizzes, or final exams, most students feel they could do without them as they are typically implemented. Even if one is a good student, there can always be that question he did not study for or did not understand in class. But once a year, a test rolls around for which one cannot prepare the night before. It is a test on which a class placement or future aspiration could depend. It is the normative-referenced evaluation comparing his abilities and intelligence to a national average.

Norm-referenced tests are designed to make fine distinctions between students' performances and clearly pinpoint where a student stands in relation to a large group. Commercial test companies usually develop these tests, and typically, many schools use the same test. The companies' survey existing curricula in order to write test items that reflects the information taught in most schools. After gathering this data, the developers prepare detailed test specifications that outline the objectives that will be tested and the number of questions that will be used to evaluate each objective.

To ensure that the final test contains an adequate number of high-quality items in each subject area, developers usually pilot the test items on a random group of students. If the test is to be used nationally, this "random group" is chosen to closely match the U.S. student population in terms of parent income, nationality, community size and geographic region. Based on the results of the pilot test, test developers keep only the items that meet certain standards. For one, the questions must generate consistent responses. Second, no question can be biased against any ethnic or gender group. And third, the test item must measure the desired learning objectives. The requirements encapsulate many of the criticisms of normative-referenced evaluation because of the difficulty in controlling these variables. Common criticisms include statements like "your standing is not based on what you know, but what your peers do not know," and "it would be to the subject's advantage to hire someone to take the test to deliberately make a low score so as to increase the subject's standing." There also is the criticism that the body of knowledge being tested is sliding a continuum based on the norm and can give a false sense either of security or of concern. This criticism addresses the issue of variability of the test scores. Test developers strive to compose items that encourage variability. In other words, they try to create questions that are not too easy or too hard. The results from the test questions should accurately rank students from highest to lowest ability. If test questions are too easy or too hard, they will not contribute to the variability of the scores, and thus these questions are usually eliminated. Consider the following example: Suppose it is possible to capture everything there is to know on a specific topic in one-thousand test items to be placed on a single test. Suppose further that no one in the population missed the first eight hundred of the items. These items would be eliminated because they do not produce variance. Suppose that the last one hundred items are so difficult that no one can answer them. They too are eliminated because they produce no significant variance. The entire test is based on the items eight hundred to nine hundred. Finally, suppose that was a "good" year. Next year the significant variance lies between 700 and 800. The norm scores will be the same but the entire scale will have fallen significantly. So, it is with caution that one interprets normative test scores

After developers select the appropriate questions for a test, they create test norms and normative test scores, such as percentiles and grade equivalent scores. These norms describe the typical performance of U.S. students on these items at the time the norms were created. In context, these norms provide a means for the classroom teacher or school district to compare the performance of one student or group of students with the performance of a reference group. The most popular and well-known norm-referenced tests are the Iowa Test of Basic Skills (ITBS), the California Achievement Test (CAT), and the Stanford Achievement Test (SAT).

Most states use one or more norm-referenced tests a year to measure their students' abilities in relation to one or more large groups of students who took the same test. School districts use this test information in guiding and counseling students, determining the eligibility of students for alternative educational programs, monitoring trends in student performance, and evaluating the school and district educational program. The results of the district's rankings usually appear in the local newspapers for the community to see how well their schools are doing, and parents are made aware of how their child measures up to the national standards. But the question

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has to be raised—how accurate and believable are the results of this test and how much meaning should really be placed on these scores?

One problem with the normative-referenced evaluation is the comparison or reference group on which the scores are based. No school or school district is completely like the normative group. In many cases, the differences are minor and inconsequential, but in other cases schools can be so different from the reference group that the national norms provided by the publisher do not accurately reflect school performance. The more one's school is unlike the standardized sample, the less meaningful the test becomes to his program.

Another area of concern is the time of year students takes the test. If your students take the test at a different time of year than the normative group was tested, the interpretation of the results will be unclear. Norm-referenced tests also have strict time limits and specific directions for administering and scoring, which can affect students' scores. Plus, the test assesses a relatively narrow range of desired educational outcomes and provides a limited number of items to measure each objective. Other limitations of the test are also evident. They are inappropriate in following an individual student's progress in a specific skill and insufficient in diagnosing a student's strengths and weaknesses in a particular subject area. Some tests may even be unsuitable for a particular district if specific features of the curriculum or of the student population are not represented in the test.

So, should norm-referenced tests be thrown out completely? Should they be cast away as so many other trends and programs in education have been? Even with all their limitations and shortcomings, there are some advantages to using a norm-referenced test in evaluating students.

For one, the test allows analysis of the general progress of large groups of students, which can be beneficial to a school district. Second, the test can give you a basis for examining an individual's general performance at certain points in the school year. Performing below average on a standardized test can be a warning signal to teachers and parents that a student needs more help in a given area. Given these benefits, a norm-referenced test should be included in a student's portfolio of work each year of school. Normative-referenced testing should never be used as the sole indicator of a student's intelligence or ability, but if used as one tool among many to chart progress, it can be highly effective.

While no one looks forward to taking or using normative-referenced tests, used in the correct way, each can become beneficial in evaluating a student's progress and in improving the student's education.

So, all teachers claim to use some form of evaluation. Regardless of the form, one should evaluate that which was taught. For too many teachers, the purpose of evaluation is to determine how much the learner has learned, compared to others. This is normative reference. In instructional design, the purpose of evaluation is always to determine the success of the instruction.

The differences between normative-referenced evaluation and criterion-referenced evaluation correspond to the differences between the Jeffersonian philosophy of education and the Jacksonian philosophy of education. To be valid, normative-referenced evaluation must discriminate between learners. Normative-referenced evaluation becomes increasingly valid, regardless of the quality, quantity or duration of learning, as the spread of the data conforms to the characteristic curve. Within normative-referenced evaluation, someone always succeeds. Someone else fails. Criterion-referenced evaluation, on the other hand, is based on what is to be produced as performance by the participant, within what conditions, and with what standards of acceptability. Each participant is compared to no one but each to himself. Comparison is made between the participant's level of achievement when he begins participation his level by the conclusion of specific experience.

In criterion-referenced evaluation, each participant may succeed at levels of the highest standards. In fact, no participant ever fails. Levels of accomplishment include the following:

1. Some participants learn more swiftly than others and may continue other experiences.
2. Some participants learn more slowly, but make consistent progress.
3. Other participants take longer. They have not failed. They just have not succeeded, yet.

## Grade Inflation

When the educational system functions as it should, randomness and chance of participant success are inadmissible to the process. Development ought to generate a curve of progression.

When purposes, content, and technique are similar, it is predictable that contemporary participants learn at last as much and as well as their predecessors. When purposes, content, and technique improve, as they ought to have done in 2500 years, contemporary learners should predictably learn more, better, and faster, retain longer, apply more often, and gain more applicable satisfaction than their predecessors. Under this system, the curve or normal probability would show a skew towards the high tail. This might be interpreted as "grade inflation" by those who do not comprehend the progression.

## Jacksonian Philosophy

Following a Jacksonian philosophy, when there is no need or intent to discriminate among learners, criterion-referenced evaluation is more appropriate. Relieved of the artificiality of arbitrarily imposed limitations, especially of time, criterion-referenced evaluation opens a trend toward increasingly universal success. Grades may, thus, appear to be inflated. The phenomenon is actually one of normal, predictable progress in production. When genuine professional practice makes rational use of valid systems of evaluation, resulting from contemporarily sophisticated, effective techniques of instruction, learners learn more and evaluation within evidence shows it.

## Worth, Dignity, and Uniqueness

Regardless of the attitudes and opinions of those who decisions in the matter, though couched apparently in contemplative trappings, are actually and finally arbitrary, any curriculum or aspect of it may not satisfy the uniqueness of particular learners. If we believe that learners have worth and dignity and are unique in their needs and differences, we must genuinely and intensively act upon it to provide each learner with optimal patterns for learning. Uniqueness requires that participants learn different experiences at different rates of speed, in different amounts, at different levels of quality and quantity.

Accountability is enhanced significantly then instruction is supported by validated media. In 2500 years, amazingly few learning experiences have been validated. Contemporary instructional banks hold only a few standardized tests and a few programmed learning experiences, and a few computer programs for learning that have been validated. Most experiences known collectively as education have never been validated. Few professionals know how to validate experiences. Few administrators know how to go about having their instructional personnel do the job. Yet, the product of the functions of learning can almost certainly be predicted to miss accountability without validation of experiences. Explanations of the failure to educate all American youth generally are couched in equivocation and sophistry. But the task can be accomplished. We need only appropriate together with an implemented intent.

## Developmental Testing

The first step in the development of a validated instructional experience is learning event design. A learning event design includes the following:

1. The definition and unambiguous statement of an intended learning goal.
2. A rationale from the point of view of the participant for expending the attention, the effort, and the time required to accomplish the goal.
3. An objective for the specific learning experience, including an overt verb describing the behavior to be developed, the conditions within which the behavior is to be practiced and demonstrated, and standards of performance acceptable as adequate and excellent.
4. Entry behaviors that need to be established, remediated, or enriched, if any, before the behavior can be developed.
5. Media to be used to convey the information, direct the practice, diagnose progress, and otherwise develop the behavior.
6. Plans for involvement correlated with the objective, and practice of the learned experiences under conditions that are real, or match reality as nearly as possible.
7. Plans for motivation for each objective.
8. A bibliography of media support establishment, remediation, development, and enrichment of behavior.
9. A statement of events to which the behavior can be applied.

The next step is to detail the development of the learning experience. One effective technique is by means of storyboarding. Storyboarding includes the following:

1. A comprehensive content outline.
2. Visuals to support facts, ideas, concepts, skills, and indicator behaviors.
3. A narrative to appropriately present the content. The narrative also includes directives for practice at tactical points, timing indicators for practice, and criterion checks to diagnose progress and indicate success.

The next step is to detail the development of the appropriate practices. The appropriate practices should be correlated with the overt verb, conditions, and standards of the objective. Cognitive performance should be appropriate. For affective behavior, appropriate practices related to indicator behaviors should be provided. Appropriate practices for psychomotor behavior should direct psychomotor practice.

When a learning experience is ready, it should be tried first with a participant as well prepared and able to learn as there is in the target audience. Any participant who is helping to developmentally test the learning experience should be informed that he is testing the event, and not that he will be tested. This first participant should be able to succeed with the experience. If he has any difficulties with the experience it can be assumed that others will also have difficulties with it. The instructor who is supervising this event should make detailed descriptive notes about anything the participant says or does related to some divergence from successful progress with the experience.

After the first developmental test, the learning experience should be revised to modify the points of difficulty expressed by the first participant. After the experience is modified, it is tried with another participant. This participant should be representative of the ordinary members of the target audience. He should be treated in all respects just as the first participant. Detailed descriptive notes should be made about any difficulties he expresses or displays. After the experience is finished, the learning experience is modified again at the points of difficulty. After the experience has been refined by modification the second time, a third participant is asked to try it. The third participant ought to be representative of the slower learners in the target audience. This participant is also treated as were the preceding two. Detailed descriptive notes are taken when he expresses or displays difficulty and the experience is again modified to conform.

Now, the experience should be tried with a small group of participants. None of the first three participants should be used. The group of participants should consist, minimally, of two fast learners, two ordinary learners, and two slower learners. They too are instructed that they are testing the event, and should freely express difficulties they encounter. The supervising instructor makes detailed descriptive notes when difficulties are expressed or displayed.

There should be few difficulties expressed from the small group of participants. The shakedown given the experience by the first three participants should go a long way towards eliminating the problems. If any are expressed or displayed, the experience should be modified again accordingly.

## Validation

Finally, to validate the experience, it needs to be tried under conditions that approach real classroom conditions as nearly as possible. Difficulties disclosed should be reason, again, to make corresponding modifications.

When, at last, the learning experience is learned successfully, within criteria, by all participants in real classes, it can be said to be validated.

Genuine professionalism in learning institutions during the opening years of the 21st century strongly indicates the need, even the requirement for the systematic, progressive development of a comprehensive bank of validated learning experiences

## NOTE

1. See *The Technology of Teaching* (1968, p. 64).

## CHAPTER 2

# PERCEPTION AND VISUAL LITERACY

Our culture has historically defined the literate person as one who possesses and is able to manipulate the basic components of written language: letters, words, spelling, grammar, and syntax. With mastery of these elements of written communication, the possibilities of verbal expression are endless. However, in the recent past our concept of literacy has expanded to include not only written language but also elements of a visual language, or visualization. This new literacy is commonly referred to as visual literacy. While admirable to do so, it is not sufficient to develop visual skills in learners by only teaching about visual literacy. The instructional designer must also teach with visual literacy skills and capitalize on the visual literacy skills of the learner. In the early years of using the personal computer in the classroom, the curriculum was often limited to teaching about the computer, rarely managing the educational process with the computer, and even more rarely teaching with the computer, and even then relegating usage to lower-level activities like drill and practice exercises. At the present time, too often the curriculum is limited to teaching visual skills but rarely is instruction designed to capitalize on the visual literacy skills of both the designer and the learner. The purpose of this chapter is to provide a foundation and superstructure of visual literacy and perception within which to design instruction.

Creativity is the goal of learning. All learning events should have as an end an observable behavior or the product of an observable behavior.

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INSTRUCTIONAL DESIGN: SYSTEM STRATEGIES, pages 61–81

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Observable behaviors and their products generally require visualization on the part of both the designer and the learner. Instructional design is often described as a visual process in that the designer must have skills to represent the underlying idea, or theory, in a concrete conceptualization which involves definitions and interrelationships. This concrete conceptualization is usually represented in a paradigm which is a visual representation of an abstract concept. The information (concept) is synthesized by the designer in a process called internalization. Once internalized, the designer prepares the message for externalization intended for a specific learner or homogenous audience. The learner, or homogenous audience, must then go through the same process of internalization (synthesizing), that is, coding and the interpreting the messages into a new whole—a new construct. Finally, to demonstrate competency the learner should externalize their synthesis in some form, again involving visualization. The highest level of teaching is teaching people to teach people to teach, so several cycles may be present in one learning event. The internalization/externalization process is involved, is sophisticated, and is visual in nature. To be successful, the designer must incorporate all that we now know about teaching and learning to design an event in a structured environment that capitalizes on the learners' capacity to learn. Each learner and designer must apply sophisticated levels of perception and skills of visual literacy.

## Visual Literacy

According to the International Visual Literacy Association, (IVLA) visual literacy can be defined as "....the ability to understand and produce visual messages. Work in the field has centered on development of educational programs that train student' abilities to evaluate and create visual messages, as well as improvement of students' reading and writing skills through the use of visual literacy techniques. Visual literacy as a field of research, study, and teaching becomes increasingly important with the ever-expanding proliferation of mass media in society. As more and more information and entertainment is acquired through non-print media (such as television), the ability to think critically and visually about the images presented becomes a crucial skill." The IVLA further states that the visually literate person then has a group of vision competencies that has been developed by seeing and at the same time having and integrating other sensory experiences. The development of these competencies is fundamental to normal human learning. When developed, they enable a visually literate person to discriminate and interpret the visual actions, objects, and/or symbols, natural or man-made, that are encountered in the environment. Through the creative use of these competencies, he is able to communicate with others. Through the appreciative use of these competencies, he is able to comprehend and enjoy the masterworks of visual communications.

These competencies describe a constructivist viewpoint in learning which holds that individuals acquire knowledge by building it from innate capabilities interacting with their environment.

Visual literacy operates within the same boundaries as verbal literacy. Just as there are components and common meaning for the elements of verbal literacy, elements and common meaning exists for visual literacy. The fundamentals of all visual communication are its basic elements: the composition of the visual materials, messages, objects and experiences. These include:

1. The dot, a pointer, marker of space,
2. The line, the restless articulator of form, in the probing looseness of the sketch and the tighter technical plan shape, the basic outlines, circle, triangle, and square,
3. Direction, the surge of movement that promotes character of the basic shapes,
4. Texture, optical or tactile, the surface characteristic of visual materials,
5. Hue and saturation, the make up of color—coordination of value with added component of chroma,
6. Scale, the relative size and measurement of an image,
7. Dimension and motion, both implied through sfumato and other techniques,
8. Light, and
9. Juxtaposition, among others.

From these elements we draw the raw materials for all levels of visual intelligence. It is with the understanding of these elements that a learner can come to understand visual syntax and the designer can produce effective and efficient instruction. A famous poet, Ezra Pound, said, "Genius is the capacity to see ten things, where the ordinary person sees only one, and the person of talent two or three." So, the job of instructional designers is to design instruction that can be interpreted at various levels ranging from the obvious to the sublime, and to prepare the learner to interpret at the highest level possible. These levels range from simple object naming to inferring meaning in complex, informational dense visual messages.

Information is presented at various levels of density. Density refers to the amount of concrete information contained within the message. For example, a simple line drawing is less dense than a photograph in that in contains less information. It is the responsibility of the receiver (learner) to fill-in the missing information. Obviously, learners vary in their abilities to fill-in. However, the skills can be taught. The better able the learner is to provide this information, the more visually literate he is. Marshall McLuhan described these levels as hot media and cool media. The following passage is from his book *Understanding Media: the Extensions of Man*:

> There is a basic principle that distinguishes a hot medium like radio from a cool one like the telephone, or a hot medium like the movie from a cool one like TV. A hot medium is one that one single sense in "high definition." High definition is the state of being well filled with data. A photograph is, visually, "high definition." A cartoon is "low definition," simply because very little visual information is provided. the ear is given a meager amount of information. Telephone is a cool medium, or one of low definition, because the ear is given a meager amount of information. And speech is a cool medium of low definition, because so little is given and so much has to be filled in by the listener. On the other hand, hot media do not leave so much to be filled in or completed by the audience. Hot media are, therefore, low in participation, and cool media are high in participation or completion by the audience. Naturally, therefore, a hot medium like radio has very different effects on the user from a cool medium like the telephone (pp. 22–23).

The more information that is provided by the sender or the message, the less that has to be filled in by the receiver (learner). Television is a cool medium in that the image in less dense than motion pictures, or film, which is a hot medium. The television image is made up of individual scan lines: 525 lines per image in NTSC (National Television System Committee, established in 1953) format used in the United States, and in most countries of the Western Hemisphere as well as Japan and some other countries of Asia; 625 lines in PAL (Phase Alternating Line, established in late 1950s and early 1960s) and used by most European countries and SECAM (Sequential Color with Memory established in late 1950s and early 1960s) used in France. A single image or picture is formed by a line that starts at the upper left of the picture, or frame, and completes the scanning of the 525 lines (or 625), top to bottom, in 1/30 of a second (or 30 frames per second) in NTSC or 1/25 of a second in PAL and SECAM. On a conscious level, one can see these scan lines quite easily. When you put your face close to the screen of a television and you examine the image at close range, you can see the space between the scan lines. Somewhere between a third and a half of the television screen is blank all the time, but we generally are unaware of it because we are busy "filling in the blanks." So, the television image provides less dense information than certain other media, which makes it a cool medium.

The motion picture, on the other hand, is a hot medium. The motion picture image is the result of an emulsion process in which light and color sensitive dyes are placed on a strip of clear acetate, exposed, developed and projected onto a screen. Close inspection of the film reveals that no spaces are present in the emulsion. Neither does close inspection of the images on the screen during projection at 24 frames per second reveal blank areas. The film image is denser that television. Film can show contrast ratios of 1000:1 while television is limited to a contrast ratio of 30:1. The human eye can distinguish contrast at a rate of 10,000:1—or better. A specific example of this contrast ratio is that it is much easier to see detail in shadow in film than it is in television. Since film is a hot medium, it requires less involvement on the part of the learner to process the information.

One notable exception may exist in this general description of television. The newest technology with television is the development of high definition television (HDTV). The change from an analog signal to a digital signal and to a change from the NTSC to HDTV increases the density of the image as well as the contrast ratio. HDTV approaches the specs of film.

What difference does the ability to classify all media as either cool or hot, and to acknowledge involvement levels, make to the instructional designer and to the learner? Involvement is desirable in learning in that before higher levels of learning can occur. The learner must be aware of the nature of the learning task, be willing to interact with the learning event, and submit controlled attention to the activity. Controlled attention is a prerequisite for higher level learning, especially for a cool medium. The hotter the medium, the more involvement planning must be included in the learning event in the instructional design. The instructional designer must be careful not to assume that the involvement planning is the end to the instruction. It does not have to be a "difficult" task. It simply requires that the learner submit controlled attention to the learning task by interacting with the involvement planning. For example, a simple worksheet requiring the learner to supply missing words to be gleaned from the main activity, such as viewing videotape, may be sufficient to obtain controlled attention.

## Perception

Perception is the foundation of learning. For learning to occur, there has to be something to learn (a message), someone to learn it (a receiver), a source of the message (a sender), and a medium through which the message is transferred from the source to the learner. Anything that transmits a message is a medium. For anything learned, all four of these components must be present. If one of the components is absent, then learning cannot occur. If one or more of the components is present but at an insufficient level, then learning cannot occur, or occurs at an unsatisfactory level.

So, learning is affected by the ability of the designer of the message to encode a message. Learning is affected by the ability of the learner to decode a message. Learning is affected by the characteristics of the encoded message. Finally, the appropriateness, quality, and quantity of the medium transmitting the message affect learning.

The instructional designer has to have skills in each of these four areas. Specifically, the instructional designer must provide, in addition to the message designed to meet the requirements of the learner's schema, an advance organizer, or framework within the learner can process the information.

Schema (the plural is Schemata) is the mental framework composed by an individual, by consisting of generic or abstract knowledge; used to guide encoding, organization, and retrieval of information. Schema are based on knowledge and formed over many instances and usually are used without the individual's conscious awareness. Although they reflect an individual's experience, they are also assumed to be shared in a culture. Jung called this shared schema collective consciousness. Once formed, schemata are thought to be relatively stable over time.

Schemata are created through experience. When we encounter something repeatedly, such as a restaurant, we begin to generalize across our restaurant experiences to develop an abstracted, generic set of expectations about what we will encounter in a restaurant. This is useful, because if someone tells you a story about eating in a restaurant, they don't have to provide all of the details about being seated, giving their order to the waiter, leaving a tip at the end, and so forth, because your schema for the restaurant experience can fill in these missing details.

Instructional designers must help learners build schemata and make connections between ideas. Since prior knowledge is essential for the comprehension of new information, designers either need to help students build the prerequisite knowledge, or remind them of what they already know before introducing new material.

Schemata grow and change as new information is acquired. Learners feel internal conflict if they are trying to assimilate schemata which contradict their previous suppositions. Teachers need to understand and be sympathetic to this tension. Deep-seated schemata are hard to change. An individual will often prefer to live with inconsistencies rather than to change a deeply-held value or belief.

Research by schema theorists indicates that abstract concepts are best understood after a foundation of concrete, relevant information has been established.

An example of how schemata may be used arises through an examination of the following passage constructed by Bransford and Johnson. This intentionally vague set of instructions was used in some research studies concerned with memory:

> The procedure is actually quite simple. First you arrange items into different groups. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step; otherwise, you are pretty much set. It is important not to overdo things. That is, it is better to do too few things at once than too many. In the short run this may not seem important but complications can easily arise. A mistake can be expensive as well. At first, the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then, one never can tell. After the procedure is completed one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.

One is not surprised to learn that readers of this passage had a difficult time processing the information. Simply by adding the title "Washing Clothes" to the passage immediately gives most readers a framework, or enables them to use an existing schema, in which to process the information. It is the task of the designer to insure that the advance organizer is a part of the learner's schemata.

Information processing theory predicts that a hierarchical organization of information will aid internalization. It allows for a structured search of memory and efficient recall and externalization. Ausubel defined an advance organizer as "introductory material presented in advance of and at a higher level of generality, inclusiveness, and abstraction than the learning task itself." The function of the organizer is to provide ideational scaffolding for the stable incorporation and retention of the more detailed and differentiated material that follows in the learning activity as well as to increase discrimination between the later material and similar or conflicting ideas in cognitive structure. To design such a framework, the designer should have skills in learner analysis (see Chapter 3) and in perception and visual literacy.

Most of us are constantly subjected to efforts by others to change our behavior. As consumers we are enticed by advertisers to buy a specific product or service; as citizens we are persuaded to a point of view by politicians; and, as people we are bombarded by religious zealots of various persuasions to become true believers. As learners, we are asked to meet competencies in cognitive, affective, and psychomotor areas. In the psychological sense, all of these solicited changes can be labeled as "behavioral" in that we are different in our actions, attitudes, and beliefs when we respond. Human behavior is an outer manifestation of inner belief systems. Our belief systems often act as the stimulus to condition a more beneficial response. They have the potential to excite, arouse, anger or pacify human behavior. They can facilitate learning by attitude changes toward awareness of a learning task, willingness to receive instruction, and submission of controlled attention as they interact with a learning event. In addition to psychological modifications, physiological changes can also be brought about by our belief systems.

One of the greatest problems facing scholars is the nature of the mind. Literature is replete with efforts to make order out of the chaos of mind processes. Even though each person has unique schemata, or organized framework, within which information is processed, there are common threads that run throughout the synthesis. For example, many scientists use the last 50,000 years as a reference for the origin of modern humans. They point out that even with this reference point, humankind had only begun to develop consciousness. Toffler tells us that if the last 50,000 years of human existence were divided into lifetimes of 65 years each, there would have been 800 such lifetimes. Of those 800, fully 650 were spent in caves. Only about 5,000 years ago did humans develop enough consciousness to be aware of their own existence. Only then were they able to communicate effectively from one lifetime to another through spoken language and writing. Jung used the reference of 5,000 as did McLuhan and other scholars of the human experience. Freud called this development of consciousness ego. For most of the last 50,000 years of human existence, the primary focus of life apparently was on what Freud called the id, or the basic instincts of survival and reproduction.

Anthropologists have noted that in many primitive societies every person is considered to have a bush soul and this bush soul contains a person's psychic identity and consciousness. An individual's identity can be lost or fragmented by the symptoms of loss of identity, such as psychosis, they often are thought to have let their soul go to the bush to be assumed by a bush animal. As in synesthesia, they take on a trait that identifies them with the bush animal. McLuhan argued that the involvement with cool media brings about loss of identity and a degree of consciousness. Critics of television have referred to it as the "vast wasteland." The reference is due in large part to the involving nature of the medium itself, not just to the content. In fact McLuhan said, in reference to all media. "The medium is the message". He once advised this writer in a personal conversation to never make a critical decision just after viewing television. "Take a walk, engage in conversation, do something, to regain consciousness and identity before making the decision."

Consciousness is always open to fragmentation. Because perceptions are innumerable and overlapping, the conscious mind must deal simultaneously with a variety of sensations. The ability to isolate a portion of one's mind, a linear process, is necessary to the performance of a prescribed task. Viewing this process as concentration on one altered sensation to the exclusion of competing stimuli oversimplifies the reality of the learning process and ignores the myriad of perceptions that the conscious mind has de-emphasized in order to focus on the prescribed task. The phenomenon, known as The Reticular Activating System, is a functional (rather than morphological) system in the brain essential for attention, concentration and introspection. A network of nerve fibers in the thalamus, hypothalamus, brainstem and cerebral cortex contribute to the system. The role of this system is to control overall degree of alertness. It is also important in the ability to direct attention. This process can be demonstrated by drawing your attention to the pressure on your bottom as you sit reading this (if, of course, you are sitting). Unless you are very uncomfortable, you probably were not aware of this tactile stimulus, at least not until I drew your attention to it. Yet, the stimulus was there; it was registering all the time and your mind chose not to concentrate on it.

So, we are bombarded by stimuli constantly. Some of the stimuli are incidental—part of the environmental surround—yet the mind is receiving, processing and evaluating the stimuli even subconsciously. Some of the stimuli are the result of planned message design intended for a specific behavioral change in the receiver and presented at a conscious level. However, some of the stimuli are the result of planned message design intended for a specific behavioral change in the receiver and are presented subliminally—at a level below conscious awareness.

The term "subliminal" and the construct that devolves in the beliefs of many people have generally created an attitude of ridicule toward the concept. At the same time mystery surrounds it. This probably has been the result of the many myths that have arisen about its use, and of some of the charlatan attempts to use the phenomenon for fake and unethical purposes. Popular literature is filled with the subject and comedy skits find it a lucrative topic.

James Vicary[1] claimed to prove the effectiveness of subliminal advertisements. He released a statement that said "in an unidentified motion picture theater a 'scientific test' had been conducted in which 45,699 persons unknowingly had been exposed to two advertising messages projected subliminally on alternate nights. One message, the release claimed, had advised the moviegoers to 'Eat Popcorn' while the other had read 'Drink Coca-Cola?'" He claimed that this testing had happened over a six-week period and that these subliminal advertisements had increased popcorn sales by 57.5% and Coca-Cola sales by 18.1%. That is all of the information he gave and he refused to give any details of the study. However, at later interview, Vicary divulged the location of the movie theater where the test had been done and when the owner was questioned about the test, he denied that a test had ever been conducted in his establishment. Later, the chief operating officer of the chain to which that establishment belonged stated that the data he was shown showed that "this type of subconscious advertising could help increase sales," but that "additional testing" was necessary. However, he did not at any time admit that the test had been conducted at any of the theaters in his chain.

Many other tales, equally ambiguous, exist about how "subliminal" techniques influence our behaviors. However, a solid research base exists about its effectiveness and potential applications.

The terms automatic activation and preconscious cueing are commonly used in the research literature to describe the phenomenon. Research has been conducted to determine to what degree automatic activation techniques can affect learning. It has generally been found that the process is not effective in the lower cognitive area, such as enhancing memorization, or increasing performance levels in the cognitive domain. However, well-designed subliminal messages have been shown to have significant effect upon subjects' attitudes. Howard Shevrin, in a statement before a U.S. House of Representatives Subcommittee of the Science and Technology Committee, testified that recent research results have amply demonstrated that preconscious perception does exits and that scientific controversy now extends to understanding how it works, what it tell us about the relationship conscious and unconscious psychological processes. Another researcher, Hal Becker, suggested a wide range of educational applications limited only by the ingenuity of the designer. Subliminal communication is efficient, unobtrusive, and powerful; and, it operates while one is fully aware of and attending to normal activities of learning.

Cognitive learning theory can be seen as a framework within which instructional designers can utilize subliminal communication. Among other things, cognitive learning theory is concerned with how the brain receives processes, encodes, stores, and retrieves information available to it. Since the mind is always receiving more information at one time than it can, or chooses, to attend to (reticular activating process) it becomes selective about what it applies to conscious awareness. When subliminal stimuli enter and remain subliminal, as they are more likely to be coded in many different ways simultaneously; this appears to enable the person to create new knowledge, even subconsciously, by the synthesis that later occurs. It also seems to affect attitudes and perceptions that are not consciously developed.

Most of the stimuli we choose not to concentrate on, yet the stimuli are there, registering in our subconscious mind. We know the stimulus was received, even subconsciously, because it can be recalled, usually while the subject is in an altered state of consciousness, such as hypnosis. Often these subjects are unable to recall the stimulus while conscious. This message can affect a person's behavior without his awareness. You no doubt have read accounts of witnesses recalling license plate numbers and descriptions of suspects with accuracy while in a state of hypnosis, but being unable to do so while conscious. We can alter our own consciousness by meditation or other techniques of self-hypnosis. Going to sleep is a form of self-hypnosis.

Individuals vary in their level of susceptibility to suggestion. Their level of susceptibility can be measured using the Harvard Group Scale for Hypnotic Susceptibility and the Stanford Scale for Hypnotic Susceptibility. Fifteen percent of the population is highly susceptible to suggestion, and another 10% to 15% are almost completely unresponsive. Most people fall between the two extremes. Some research findings conclude that women are more susceptible to suggestion than are men.

Jung tells of an experience he had as an older man. He was walking through a barnyard on a warm spring day when he was suddenly overwhelmed by pleasant thoughts of his father, long deceased. His first impulse was to continue his walk and pass the thought lightly, but his curiosity was at work. Why, he asked himself, did he suddenly, with no apparent stimulus, have these remembrances of his father? After stopping to relax under a tree and meditate, he concluded that once in a similar setting, as an adolescent, he had a lengthy talk with his father that had been meaningful to him; it had helped create a bond with his father to a degree he had not experienced before. On this day, years later, the sounds of animals, the warmth of the sun on his skin, the odors of the barnyard, the season of the year, and no doubt many other sensations subconsciously reminded him of the event and affected his mood. A person's mood can affect other behaviors such as their buying patterns, their belief systems, and even their ethical behavior. Even their perceptions can be affected by suggestion. Most *déjà vu* experiences are the product of such stimuli whether presented consciously or subconsciously. Usually we are at a loss to explain the *déjà vu* and tend to regard it with great mysticism.

Perception is the foundation of learning, yet humans never perceive or comprehend anything completely. How well one perceives depends upon the quality and quantity of one's sensory abilities. To interpret from sensory perceptions and derive meanings depends not only on the actual physical state of the perceptions but also on how such experiences are integrated into other sensory experiences and on the influences of past cultural experiences. These experiences along with intellectual (to include cognitive, psychomotor, and affective) experiences form a schemata within which all stimuli are processed and behaviors manifested. Such a complicated picture of the consciousness of the individual makes it obvious that there are an infinite number of stimuli, which are unknown to both the sender and the receiver. These stimuli either remain below the threshold of consciousness, or relegated to the subconscious by the reticular activating system, they are absorbed subliminally. Adding to the complication of this picture is the person's schema. While there have been efforts to produce a cognitive map, to date we have not cracked the code for profiling an individual's schema.

It must be assumed that, like all information available to the mind, these stimuli have effects on psychomotor skills, cognitive abilities, and attitudes of the individual. The unconscious, the object of much educated guesswork since the contributions of psychoanalysts such a Freud and Jung, holds the secret of what influences persons. Constantly occurring subliminal stimulation can either interrupt or reinforce learning. Because of the physical limitations of a person's senses, there always will be stimuli beneath his conscious awareness that affect his learning environment. To ignore the existence of subliminal stimuli and reception, and their subsequent effects, is to make the assumption that the psyche is total. Those who reject the existence of subliminal stimulation and its effects merely express a misoneism.

A review of research shows that as subliminal messages are drive-related they tend to be more effective, especially if the drive is less likely to be satisfied at a given moment. According to Freud, that deemed sexually disgusting has appeal for adults even if there is a response of disgust. Also, a higher state of consciousness in the receiver of the message produces greater effects of the message. Another research finding is that the stimulus can have a delayed effect and that the deeper the stimulus is below the threshold level for conscious perception, the greater the effect and the longer the effect can be extended. Known as the Poetzel Effect, the phenomenon was first described by the German researcher in the early twentieth century.

Of the many possible explanations for the automatic activation of a behavior by a preconscious stimulus, the concepts of perceptual defense and associative response are perhaps most respected.

## Perceptual Defense

In the perceptual defense theory the ego is responsible for the selection and screening of stimuli, and stimuli are capable of threatening the superego. Perceptual defense is a term used to refer to the fact that the conscious perception of some stimuli requires a longer exposure than perception of other stimuli. In other words, the thresholds for recognition of certain stimuli are higher than the thresholds of recognition for other stimuli. Threatening stimuli activate ego defenses by altering thresholds, thereby keeping much of the information from the conscious. However, the information is stored in long-term memory and is processed in such a manner as to be unlimited in the associative responses it can trigger. When stimuli enter and remain subliminal, they are more likely to be coded in many different ways simultaneously. This subconscious coding would appear to enable one to create new knowledge, even subconsciously, by the synthesis that occurs.

## Associative Response

An example of an associative response is classical conditioning. Classical conditioning provides one of the simplest and most pervasive ways we learn.

The response generated by association is automatic. It is automatic in that conditioning occurs whether we want it to or not. No conscious thought is required for conditioning to occur. It is valenced in that conditioning depends on the linking of stimuli with negative or positive reinforcements. Said another way, conditioning happens when we are emotionally engaged either positively or negatively. The response is indiscriminant in that we associate all aspects of the environment with the negative or positive conditioning. It is correlative in that occurs without our understanding of causal relationships. When one feels nauseous, the cause may or may not be the food he has eaten. Nevertheless, the body will assume that any coinciding stimulus may be important. The indiscriminant nature of classical conditioning is probably the best approach to learning, since we cannot be certain of the causal connection.

People are immersed in subliminal stimuli constantly. Many sounds, smells, and visual input occur without conscious acknowledgement, but are nevertheless subconsciously recorded. Human beings sense, perceive and react to many consciously undetected stimuli. Ultrasonics, infrasonics, radar, microwaves and various forms of radiation can produce bodily reactions without conscious awareness, so obviously there are various levels of awareness within human beings. Even while asleep or with certain brain areas anesthetized, other brain areas can perceive certain things and cause the body to respond to stimuli.

Several techniques are commonly used to present visual subliminal messages. The first to be described is the use of projected images which vary in intensity and duration.

## The Tachistoscope

The tachistoscope is a device designed to present a visual stimulus for a short, adjustable exposure time. It has been described as a machine that displays a series of rapid projected visual images in order to measure attention, perception, and learning. This projection device makes it possible to project messages at varying intensities and for varying duration. The tachistoscope is easily used alone, or with other visual media, such as the motion picture. It can be used on either front-screen or rear-screen systems.

During World War II, military psychologists developed training for pilots and gunners. They flashed fairly large pictures of friendly and enemy aircraft at slow exposure speeds then gradually increased the exposure speed while decreasing the size of the aircraft image. Pilots could quickly be trained to recognize even speck-like representations of different planes when flashed at only 1/100 of a second.

Tachistoscopic techniques are currently being used by collegiate and professional football teams to teach football quarterbacks how to spot the open pass receiver almost automatically.

Numerous examples exist of usage of the tachistoscope in learning and demonstrating that a message below conscious awareness was received and a response was generated One such application involved paring a painful electrical shock with certain tachistoscopically projected images at a conscious level. Blood pressure, heart rate, and galvanic response monitors were used to measure the responses made by the subjects. Certain of the symbols projected at a conscious level were paired with the electrical shocks. The remaining symbols were "neutral." No shocks were associated with the neutral symbols. The subjects were conditioned to respond to the symbols. When they were subjected to a shock-paired symbol they responded with increases in blood pressure, pulse rates, and galvanic skin response levels. Even when no shock was administered a response was present. The subjects were then presented the images at a subliminal level (below their conscious awareness) via the tachistoscope. Those symbols that had been paired with electrical shocks continued to get increased biological levels while the neutral symbols got no responses. The results have been interpreted as conclusive evidence that subception occurred.

As noted earlier, many myths have arisen about the use of projected images below the threshold of conscious awareness. One of these myths is that a single frame can be inserted into a motion picture film at a specified place which is intended to be perceived by the viewer at a preconscious level. The fact is that this is not possible. A film frame travels at a rate of 1/24 of a second through the aperture of the projector. Add to this the phenomenon of persistence of vision in which the image is captured on the retina of the eye for a like period of time, it is well within the threshold of awareness of almost all of us.

So, automatic activation can be accomplished through use of the tachistoscope. The message can be presented at varying speeds of up to 1/60,000 of a second—well under the threshold level and can be considered "subliminal."

The speed of the projected image is just one of the independent variables affecting its results. The intensity, or the brightness of the image is a factor. These two variables work together. For example, if an image is projected onto a surface at an intensity of 60 foot-candles where the ambient light is at 40 foot-candles, the speed at which the image is presented will need to be much faster to keep it at a preconscious level. As the foot-candle intensity decreases, the duration can be increased all the way to a continuous level.

## The Rheostat

Light is an additive process. Consider the following: Using a light meter (preferably a laboratory model), the ambient light in a room is measured at 40 foot-candles in intensity. The ambient light is turned off, and an image is projected and measured at an intensity of 1 foot-candle. In other words, while the room light is off, an image is being projected onto a surface at an intensity of 1 foot-candle. This 1 foot-candle image is easily seen. It is not subliminal. However, when the room lights are turned back on, there is on the surface 41 foot-candles (the 1 foot-candle projected image plus the 40 foot-candles of ambient light). There is at that point a ratio of 41:40 (projected image plus the ambient) on the projected surface. Such a contrast is not easily discernable and in fact remains at a preconscious level, but it is there, registering all the while and automatically activating one's schema, the framework within which one processes information.

This phenomenon is easily achieved. A 35-mm Kodak Carousel slide projector has an input on the rear panel which accepts the wires from a 60 cycle, 110-volt light dimmer. This dimmer is commonly used on light switches in homes where the occupant wants to control the intensity of light in a room—for example, a den. The dimmer, when attached, can control the intensity of the projection lamp while having no effect on the cooling motor. The motor continues to run at the "regular" speed and will cause no harm to the projector. Only the projected image is varied. The projected image, carrying the message, can be projected continuously. It does not have to be placed on a projection screen. It can be projected on any surface at any point in the room. It becomes part of the environment.

Marshall McLuhan called those elements within an individual's environment, with which he or she interacts consciously and sub-consciously, the "environmental surround." There are always so many perceptual particles within this surround that no individual could conceivably concentrate consciously upon everything at the same time. Conscious awareness, therefore, is always fragmented. Because visual, auditory, tactile, gustatory, and olfactory perceptions are innumerable, continuous, and overlapping, the conscious mind cannot deal simultaneously with all of them. The ability to isolate, concentrate, or abstract a small portion of the perceptions available at any given moment into a linear, logical, definition-oriented language process is considered the basis for evaluations of intelligence—whatever that may mean from day to day and from person to person.

The process appears to be a concentration upon a small portion of perceptions to the exclusion of competing ones. Consciously perceived reality is usually a vast oversimplification, an abstraction, of actual perceivable reality. The myriad of perception that conscious awareness has de-emphasized, set aside, placed out of focus, subordinated to ground, and/or repressed, remain in the brain's unconscious storage for varying periods of time. Perhaps some perceptions are stored permanently.

Perhaps the most critical independent variables, in addition to the speed of projection and the intensity of the projected image, are the effectiveness of the visual design of the message the degree to which the message elicits a perceptual defense and/or an associative response from the subjects. Visual design can be learned fairly easily and basic principles are included in the next chapter. If the instructional designer chooses, the services of a professional designer can be contracted. In order to predict perceptual defense and associative response, though not necessarily concurrently, one must conduct rigorous audience/learner analyses. The more the designer knows of the subjects' schemata, the easier and better he can design the visual messages.

This task is extremely difficult because each person possesses a schema that will vary from that of all other persons. This schema is the framework with which each of us interprets information, and we may each interpret the same information differently. This is where Jung's concept of collective consciousness becomes so important and why so many researchers choose to use the libido, perceptual defense, and associative response mechanisms as independent variables.

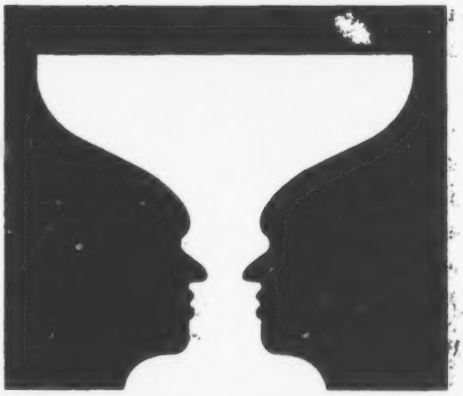

Figure 2.1. Figure-ground.

## Figure-Ground and Embedding

The techniques of embedding and figure-ground reversals are probably the ones best known to most designers, as well as casual readers, and the ones likely to attract the most curiosity.

These techniques, embedding and figure-ground reversals, appear to be in common practice in advertising. By examining advertisers' techniques, one can transfer them to the teaching/learning environment. Wilson Bryan Key, author of *Subliminal Seduction, Media Sexploitation, The Clamplate Orgy*, and *Subliminal Ad-ventures in Erotic Art*, reminded us that the illusion is still popularly cherished that humans individually—all on their own—are in total control of their own thoughts, values, and behaviors. We believe that we think entirely for and by ourselves. Every day advertisements, logos, and slogans bombard us. They tell us what to buy, who should lead us, and anything else that advertisers wish to influence us about. We have become so accustomed to being bombarded by these icons that we consciously pay them little mind. After a trip abroad, one is often heard to remark that the advertising in this country is overwhelming and upon returning to this country it takes a while to become anesthetized to the bombardment. However, even when we are anesthetized, or when the reticular activating system chooses not to devote conscious awareness to the stimulus, these ideas and slogans go subconsciously into our minds. This phenomenon leads to a society that is told what to eat, drink, buy, wear, and most importantly, what to think. While it is important to look at what the designers say, we must first examine how they say it.

In order for any person to perform an action that he would not normally do of their own accord, they must first be convinced that it is what is best, and they must choose to do it themselves rather than be forced into doing so. Subliminal messaging can be used to put a thought into the mind of the viewer. A subliminal is any message which is conveyed to a person without that person's realization.

The part of a composition that we pay attention to is called figure. The figure is also called a positive shape. In a simple composition there may be only one figure. In a complex composition there will be several things to notice. As we look from one to another they each become figure in turn. Recognizable objects (subject matter) are easy to see as figure. In compositions without recognizable subject matter what we see as figure will depend on the abstract relationship between the visual elements. The most interesting at any moment is the figure.

Everything that is not figure is ground. As attention shifts from figure to figure the ground also shifts so that an object can go from figure to ground and back. Ground is sometimes thought of as background but this is not always true. In a flat composition there is nothing behind the figure. The shapes are side by side.

Figure-ground reversals involve the two divisions of visual perceptions which are the figure (subject and foreground) and ground (the background supportive to figure and the environment in which figure exists). Areas environing to the figure are taken for granted and are quite often ignored. The actions of figure are watched and taken in consciously, while ground is absorbed on a subconscious level. If there is any disturbance in ground then it becomes figure. Some individuals are more perceptive than others and constantly scan both figure and ground for any change in meaning. Artists, recognizing the value of ground, often put the meaning of their works in ground. Many of the more striking artistic pieces take advantage of this. Advertisement artists eventually learned that figure could be lowered to platitude, a safe, non-controversial topic, while the ground could contain the really controversial subjects, important information that would be perceived unconsciously.

Embedding is the process by which one image or icon is worked into or around another as to make the image being advertised stand out while the secondary image is ignored and remembered unconsciously. In embedded pictures, nothing is actually hidden.

Most of us are conditioned to look at the figure, not the ground. It takes special effort and special skills to see the ground. Designers of subliminal messages routinely take advantage of this conditioning. For example, when we look at a "regular" 8 1/2 by 11 inch piece of white paper we look for any message (figure) that might be on the paper, for example, print or graphics. We ignore the paper itself—the ground. As you read the pages of this book the text and graphics (the "black") is the figure. You automatically see the figure and find it difficult to see the "white,"—the ground. In fact, you will probably find it difficult, if not impossible to convert the ground to figure and suppress the text to ground.

How can this be effectively used in an instructional setting? The printed page is made up of points, sometimes called pixels, and in printing is sometimes called dots. Most home computer printers have the capability of printing at least 1,440 dots per inch (called dpi). The more dpi on a printed page, the denser, or the more detail is in included in the image. One thousand four hundred forty dots per inch will have less "white space" between dots than one-fourth that amount, three hundred sixty. In fact, the number of dpi can be manipulated in the printing and production process to be quite small. The dpi can be so few, and the percentage of opacity can be so low, that the background remains as ground when a figure is placed on it. In the examples below, Figure 2.1 has a black background at seventy-two dpi and an opacity level of 2%. In Figure 2.2, the background is black at seventy-two dpi and 2% opacity level, and the figure (text) is white at seventy-two dpi and 100% opacity level. The message (figure) in this example (text) is white. It is printed on a background (ground) that is perceived by the viewer to also be white. Yet there is a ratio of 50:49 with the ground being more opaque. As with the rheostatically projected low-light level image in the earlier example, the message printed on the ground is subliminal—it is not consciously perceived. But, it is there, and has an effect. Another characteristic of this example is that we are conditioned to see black, or color, on a white ground. In this example, the figure is even whiter than the ground—in effect a photographically negative image. We are not conditioned to see negative images, photographically speaking.

When we apply McLuhan's "hot" media "cool" media theory, we can say that the subliminal paper is "cool." There is little dense information yet it is

Ground is Black
72 dpi @ 2% Opacity
(no figure)
Ground is Black
72 dpi @ 2% Opacity
Figure is white
@100% opacity

Figure 2.2. Embedded message using figure-ground.

there. The viewer (learner) will not likely concentrate on it because the reticular activating system filters the information out and because it is difficult for him to change from figure to ground and vice-versa. The viewer/learner must become involved at an even greater level to process the information. In doing so, they lose some of their identity and must replace it. This makes them even more susceptible to any suggestion that is included in the message. Studies conducted by the authors demonstrated that submission of controlled attention, self-esteem, attitudes affecting involvement, and performance on cognitive coursework can be affected.

Many readers will remember Vance Packard's seminal work in the 1950s, particularly in *The Hidden Persuaders*, as an early attempt to inform us of the influence of packaging, product image, symbolism, association, self-image (to tell us who we are, what we like, what kind of person we need to be, and so on), and other techniques in persuading us to buy a particular product or service and to form opinions about persons or issues. Messages intended for the subconscious have been designed for hundreds of years; however, they seem to have proliferated in the past half-century. This proliferation prompted Marshall McLuhan to note that 1984 (the Orwellian concept) actually occurred in 1934, but we were too busy to notice.

As earlier noted, artists, recognizing the value of ground, often put the meaning of their works in ground. Instructional designers, in one of their collorary roles, are artists. Remember that instructional design is primarily a visual process. Symbols, icons, situations, and in general covert messages are often part of the environmental surround, or ground, and in this setting they do not attract the conscious attention of the casual viewer. According to Jung, symbols and icons are universal and are interpreted the same way by all humans since we have a collective consciousness.

Historically, messages that appear in visual images are frequently sex and death related. Sex and death are parts of what psychologists call the libido. The libido is that emotional or psychic energy that derives from primitive biological urges and is usually goal directed; in other words, it involves one's sexual drive. These libido messages are more apt to trigger perceptual defense mechanisms and to elicit associate responses either positively or negatively.

The phenomenon of subliminal messages and subsequent behavioral change in the receiver/learner is daily gaining credibility and is becoming more widely accepted by informed members of academia and by those professionals who are engaged in the profession of teaching and training. Research has amply demonstrated that the phenomenon does exist. Scientific controversy now extends to understanding how it works and what it tells us about the relationship between conscious and unconscious psychological processes. A wide range of therapeutic, educational, and industrial applications for subliminal communication exists, possibly limited only by the creativity and ingenuity of the instructional designer. Subliminal communication is efficient, unobtrusive, powerful, and operates while one is fully aware of and attending to normal activities in learning.

Left unanswered is the question, "What are the threats to the rights of individual autonomy and personal privacy?" Any message not deliberately disclosed to the learner is a preconscious stimulus that is designed to elicit an automatic response from the learner. For example, any histrionic behavior on the part of an educator to boost learner motivation could fit the definition of subliminal persuasion. Is this act an invasion of personal privacy and a threat to the individual autonomy to remain unmotivated if the learner chooses?

## NOTE

1. See Rogers, Stuart. "How a Publicity Blitz Created the Myth of Subliminal Advertising." *Public Relations Quarterly* (Winter 1992/1993) 37(4): p. 12.

## CHAPTER 3

# LEARNER ANALYSIS

In our contemporary world, it seems likely that educators will be faced with a situation in which there are more people to be taught and in which there is more to be learned. It appears to many instructional designers that the only way our educational and instructional systems can meet their obligations is to look beyond the numbers and focus upon the individual. Human variability and individual differences have traditionally been taken to be facts. If these differences and variability's are ignored educators will continue making the same mistakes they have made in the past. If not ignored, by giving constructive efforts to analysis of a comprehensive battery of learner characteristics, the learning event and the results can be improved predictability and observably.

Because achievement levels among learners of given ages vary enormously, these levels must be taken into account in all planning and organizing for teaching.

Like medication, instruction can be given when none is needed. It is also possible to prescribe ineffective modes of instruction when other modes of instruction would be more pertinent. Goals which are inappropriate to the needs and nature of the learner are wasteful, erosive, confusion-generative, and generally unproductive. They may even militate against beneficial learning when the opportunity for such learning, at last, arises. Therefore, it is as appropriate to conduct an analysis before designing instruction as it is for a physician to make a diagnosis before describing a cure.

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INSTRUCTIONAL DESIGN: SYSTEM STRATEGIES, pages 83–133

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Viewing man as a class of creatures, one is struck with the common features shared by all members of the species. Specifically, each Homo sapiens has many features in common with other members of his species. Based on the subsistence characteristics of his life frame, there is a significant amount of commonality among all men. Yet, at the level of thoughtful behavior, leading to cultural norms and innovations, a group of men may be characterized by the startling person-to-person differences that make agreement of statement of purpose kaleidoscopic in potential. These differences complicate teaching and learning. In this sense, while men are born equal, cultural aspects impinge on them to make them different and unequal.

The problem becomes one requiring isolation, interpretation, and analysis of the differences. Comprehensive analysis facilitates bringing to bear the better kinds of prescriptive treatments portending to generate behavior changes desirable to whoever seeks them.

## Superstructure of Learner Analysis

To facilitate development of appropriate goals the following determinations about the learner should be made.

### *Sensory-Motor*

1. The ability to hear clearly (Auditory).
2. The ability to see clearly all significant details (Visual).
3. The ability to receive and interpret appropriate aromas (Olfactory).
4. The ability to receive and interpret appropriate tastes (Savory).
5. The ability to feel and interpret appropriate tactile stimuli (Tactile).
6. The ability to detect and interpret for appropriate applications, degrees of bone-joint angulations, change angulations, muscle stretches, and tendon tensions (Proprioceptive).
7. The ability to perform and develop a relevant set of motor skills (Kinesthetic).

### *Symbol Manipulation*

8. The ability to read with optimal speed and comprehension at pertinent levels (Reading).
9. The ability to write efficiently and expressively at pertinent levels about pertinent matters (Writing).
10. The ability to use learning techniques with efficiency and effectiveness (Cognitive Learning Skills).

11. The ability to compute relevant problems involving quantities which can be symbolized numerically (Computation).

*Spatial Relationships*

12. The ability to construct a diagram displaying the relationship of components making up three-dimensional whole objects (Diagrammatic Planning).
13. The ability to interpret diagrams which represent three-dimensional whole objects made up of components (Diagrammatic Interpretation).
14. The ability to predict the structural form(s) of three-dimensional whole objects, made up of components, on any of its aspects which are normally invisible in a two-dimensional view (structure analysis).

*Oral Communication Skills*

15. The ability to speak efficiently and expressively at pertinent levels about pertinent matters (Speaking).
16. The ability to listen skillfully (Listening).

*Personal Identity*

17. The ability to interpret one's relationships to environment and to revise and refine either, or both, optimally (Synnoetics).
18. The identification and interpretation of the influencing ethnic concepts and interactive behavior of others, as they relate to one's own (Ethnic).

*Cultural Determinants*

19. The identification and interpretation of organization and practices of others, as they relate (Family).
20. The identification and interpretation of the religious concepts and practices of others, as they relate (Religion).
21. The identification and interpretation of the influencing peers of others, and the relationships of those peer members to one's own peer group (Peer Influences).
22. The identification and interpretation of functional patterns of mores, as they influence the behavior of others, and as they relate to one's own (Mores).
23. The identification and interpretation of agencies which influence the learner (Social Agency Influences).

24. The identification and interpretation of the influencing political concepts and practices of others, as they relate to one's own (Politics).

### *Interactional-Transactional Patterns*

25. The ability to receive, interpret, and use non-verbal language intended to create effects (Kinesics).
26. The ability to judge and respect, perhaps tactfully penetrate, the critical physical and social distance fields of others, and to extend one's personal fields to optimal limits (Proxemics).
27. The ability to maintain an interaction of influence with a variety of others (Transactionals).

### *Affective*

28. The ability to receive, interpret, and commit to a describable set of values, or moral principles, obligations, duties (Ethics).
29. The ability to receive, interpret, and identify with feelings, ideas, emotions, and purposes of others (Empathic).
30. The ability to receive and interpret situations, products, and ideas in terms of the beauty or pureness of their character (Esthetic).
31. The ability to observe, interpret, or perform a staged behavior, or a deliberate exhibition of emotion or temperament, apparently intended to have a deliberate effect on others (Histrionics).

These components can be combined in a superstructure of learner analysis.

Name ______________________________

| | | Less Than Standard | Standard | Greater Than Standard |
|---|---|---|---|---|
| Sensory-Motor | Auditory | | | |
| | Visual | | | |
| | Olfactory | | | |
| | Savory | | | |
| | Tactile | | | |
| | Proprioceptive | | | |
| | Kinesthetic | | | |
| Symbol Manipulation | Reading | | | |
| | Writing | | | |
| | Cognitive Learning Skills | | | |
| | Computation | | | |
| Spatial Relationships | Diagrammatic Planning | | | |
| | Diagrammatic Intrepretation | | | |
| | Structure Analysis | | | |
| Oral Communication Skills | Speaking | | | |
| | Listening | | | |
| Personal Identity | Synnoetics | | | |
| | Ethic | | | |
| Cultural Determinants | Family | | | |
| | Religion | | | |
| | Peer Influence | | | |
| | Mores | | | |
| | Social Agency Influences | | | |
| | Politics | | | |
| Interactional Transactional Patterns | Kinesics | | | |
| | Proxemics | | | |
| | Transactionals | | | |
| Affective | Ethics | | | |
| | Empathic | | | |
| | Esthetic | | | |
| | Histrionic | | | |

Figure 3.1. Learner Analysis

The superstructure is composed of eight components of analysis. Each of the components of analysis is composed of elements relevant to that specific component. When each of the components and elements are treated individually and then combined on the superstructure the result is

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a profile which provides a comprehensive picture of the learner. Use of the profile will enable the learner to be pictured on a continuum as possessing a cognition, skill, and/or attitude to a degree that is less than standard, standard, or greater than standard. The instructional designer uses normative-reference or criterion-reference to establish the standard. The critical realization is that before realistic, defensible goals can be written, they must be based upon a standard. They are designed, not left to the whim of the designer.

### Sensory-Motor Component

Normally, learners utilize the five basic senses in the process of learning. Instructional design does not take into account the specific ability of any learner to use any of his senses when the physiological senses of the learner have not been measured. For example, a learner may hear to a degree that is less than standard, to a standard degree, or to a degree that is greater than standard. If the goal does not allow the learner to function optimally within the limits of his hearing ability, then effective and efficient learning is less likely to take place.

### Symbol Manipulation Component

Goal achievement incorporates the process of symbol manipulation through reading, writing, cognitive learning skills, and computation. For example, learning skills include note taking, test taking, problem solving, group participation, and library skills and strategies. Goals not based on the degree of skill held by the learner will make any learning that takes place accidental, rather than by design, in nature.

### Spatial Relationships

For the learner to convey, and sometimes receive, meanings from symbols it is sometimes necessary to interpret diagrams, and appropriate goals need to take into account that learners vary in their skills in interpreting diagrams. The degree to which the learner possesses skills in spatial relationships should affect the design of the goal.

## Oral Communication Skills

The process of education directly involves the process of communication, and the process of communication directly involves the acts of speaking and listening. Speaking is a process of sign reception (aural), and both convey a common meaning between and among interactors. Yet, learners vary in their ability to speak and listen. Goals designed irrespective of the nature of the learner's speaking and listening ability are ineffective.

## Personal Identity Component

Most social scientists agree that a learner's environment has as great an effect on the development of psychomotor, cognitive, and affective aspects as does heredity. Each learner varies in his ability to interpret his relationship to his environment, adapt to his relationship, or refine either, (or both), optimally. Goals should take into account the degree to which the learner interprets, adapts, or refines his relationship to his environment.

## Cultural Determinants

Family, religion, peers, mores, social agencies, and politics are cultural determinants which influence the learner. For example, folkways have their origin in the instinctual drives of humankind. Persons begin with acts, not thoughts. Every moment brings necessities that must be satisfied at once. Need is the first experience. Analogy makes it easy to assume that the ways of ancestors have produced channels of habit and predisposition along which psychophysical creativities could easily run. All adopts the same way for the same purpose based on other's experiences; then the ways turn into customs and become mass phenomena. The young learn customs by tradition, imitation, and authority. Folkways are uniform, universal in the group, imperative, and invariable. As time passes, the folkways become increasingly arbitrary, positive, and imperative. Folkways become coercive. All are persuaded by reinforcement or are forced to conform, and the folkways dominate societal life. Then, they seem "true" and "right," and arise into mores as the norm of welfare. As a result, faiths, ideas, doctrines, religions, and philosophies arise. Goals not taking this phenomenon into account are sheer audacity.

### Interactional-Transactional Patterns

As previously demonstrated, the learning process is enhanced by the ability to communicate. In addition to the aforementioned skills, the ability to communicate by means of nonlinguistic functions and motions of the body, such as shrugs, and gesticulations is an integral component. Also, each learner projects physical and social distances between himself and others in the act of communicating. Learners vary in their abilities to communicate and to project physical and social distances as well as they vary in their ability to maintain a positive communicative interaction which significantly influences the goals of others involved in that interaction. This ability is especially salient when prescribing the modality of instruction for any learner. For example, a learner with greater than standard ability in transactionals likely would find modes of instruction that involve leadership as a primary task, or opportunity, to be particularly relevant.

*Affective*

To varying degrees learners are committed to a set of values, a group of principles, obligations, and/or duties. Learners often identify with another person's feelings, ideas, or volitions, either actually or vicariously. This empathy has implications for establishing goals. Learners vary in their ability to receive and interpret situations, products, and ideas in terms of the beauty or pureness of their character, as well as variance within ethics and empathy. But a learner may find beauty or pureness in a task performed well, in an idea, or in a form of government. Opportunity to operate optimally within this affect enhances learning.

## AUDITORY

Normally and physiologically, learners utilize the five basic senses in the process of learning. Learning events do not take into account the specific ability of any learner to use any of these senses, in particular, when the physiological senses of the learner have not been measured. For example, a learner may hear to a degree that is less than standard, to a standard degree, or to a degree greater than standard. If the learning event does not allow the learner to function optimally within the limits of his hearing ability, then effective and efficient learning is less likely to take place.

Auditory perception is a function of acoustic stimulation by vibrations of a frequency range between 30 Hz (Hertz) and 15,000 hZ and 120 dB (decibels). Frequency and intensity discrimination varies widely as a function of the frequency and intensity of the stimulus tone.

The weakest signal which gives rise to a sensation that is just barely detectable as sound is called the auditory threshold. The amplitude of the signal at threshold varies as a function of the frequency of the signal.

Decibels refer to the sound pressure level above a reference level. The standard reference level for sound pressure is 0.00002 newtons/m2. Decibels are symbolized as dB.

Sound frequency is measured in Hertz, symbolized as Hz. Frequency refers to the quantity and speed of Hertzian waves impact on a receiver. Hertzian waves are composed of electrical impulses at the radio segment of the spectrum of light.

Amplitude refers to the loudness of a stimulus. The minimum difference in level between two tones of the same frequency that can be discriminated is called the intensity difference. The size of this difference is a function of both the frequency and the sensation level.

The audible frequency range extends from approximately 40 to 15,000 Hz. Each frequency gives rise to a sensation of a certain pitch. Pitch is not only a function of the frequency of the stimulus tone, but also of its sound pressure level. For tones above 2,000 hZ the pitch increases with intensity, while for those below 2,000 Hz it decreases in intensity. The discrimination of differences in pitch between two tones is mainly a function of the frequency of the two tomes.

Above a 5 dB sensation level all tones have a definite pitch; for example, the minimal pitch of a tone may be given in musical notation (CDEFGAB). Most individuals can name a given tone when given a reference tone, but cannot name a tone when asked to without a reference tone. Figure 3.2 illustrates the framework of the auditory component. Using this framework the designer of the learning event can develop a profile of the learner that will facilitate the design of a learning event based on the needs and nature of the learner.

| THRESHOLD | | | STANDARD | LESS THAN STANDARD | GREATER THAN STANDARD |
|---|---|---|---|---|---|
| Detection | Decibels (dB) | | | | |
| | Hertz (Hz) | | | | |
| Discrimination | Amplitude Intensity | | | | |
| | Frequency Range | | | | |
| Identification | At or Below 5 dB | | | | |
| | Above 5dB | C | | | |
| | | D | | | |
| | | E | | | |
| | | F | | | |
| | | G | | | |
| | | A | | | |
| | | B | | | |
| | | | | | |

Figure 3.2. Auditory.

## VISUAL

A learner may see to a degree that is less than standard, to a standard degree, or to a degree greater than standard. If the learning event does not allow the learner to function optimally within the limits of his seeing ability, then effective and efficient learning is less likely to take place.

Visual acuity means literally "sharpness of vision." Acuity can be defined in terms of the smallest object that can be seen at a standard distance. In optical measurement the usual standard distance is 20 feet, the object is 20 centimeters in height, and the illumination is 100 foot candles. For nonreaders, the standard is the minimum distance at which two parallel lines are definitely separable.

The periphery of a learner's vision is the distance from the center of focus at which significant detail or motion can be perceived.

In night blindness vision is defective in dim light while day and color vision is normal. Day blindness is characterized by defectiveness in color senses.

The Young-von Heolmhotlz theory of color vision postulates three types of receptors—each sensitive to one of the primary colors. Color sensation results from stimulation of these elements at different relative intensities.

The three qualities of color (hue, saturation, and brightness), and the relationship between them, can be shown in a three dimensional color solid which has one dimension representing hue, a second for saturation, and a third for brightness. All combinations lie within its boundaries.

**Hue**. The linear distance from a point on one wave of light to the corresponding point on the next wave length determines hue. The normal visible spectrum ranges from violet to red.

**Saturation**. Saturation is the purity of the wave-length of reflectance involved.

**Brightness**. The brightness of a color is determined by the intensity of the light in proportion to the foot-Lamberts of reflectance of the surface which holds the color.

## Color Blindness

Color blindness is a result of defective, or absent, cones in the retina of the eye

### *Total Color Blindness*

Total color blindness is a result of total absence of cones in the retina, and this condition is relatively rare.

### *Dichromatic Color Blindness*

Dichromatic color blindness is a condition of normal vision for two primary colors, usually yellow and blue, and a weakness, or blindness, in distinguishing red or green or both, in varying degrees.

## Visual Defects

Visual defects are determined by optometric measurement. Some of the common visual defects that designers of learning events need to take into account include:

**Myopia**. Myopia is a condition of near-sightedness.
**Hyperopia**. Hyperopia is a condition of far-sightedness.

**Astigmatism**. Astigmatish is a condition of clear vision, in one dimension, and fuzzy vision is another dimension.
**Diplopia**. Diplopia is a condition of double vision.
**Scotoma.** Scotoma is a condition of having a blind spot which can be either permanent or temporary.
**Presbyopia**. Presbyopia is a condition of hardening of lens that usually accompanies the aging process.

Figure 3.3 illustrated the framework of the visual component of the superstructure of learner analysis.

| | | | STANDARD | LESS THAN STANDARD | GREATER THAN STANDARD |
|---|---|---|---|---|---|
| Acuity | Peripheral | | | | |
| | Night Blindness | | | | |
| | Day Blindness | | | | |
| Color Vision | Quality of Color | Hue | | | |
| | | Saturation | | | |
| | | Brightness | | | |
| | Color Solid Perception | | | | |
| Color Blindness | Total | | | | |
| | Dichromatic | | | | |
| Visual Defects | Myopia | | | | |
| | Hyperopia | | | | |
| | Presbyopia | | | | |
| | Astigmatism | | | | |
| | Diplopia | | | | |
| | Scotoma | | | | |

Figure 3.3. Visual.

## OLFACTORY

The ability to use the olfactory sense is important in the learning process. Learners vary in their ability to smell.

### Identification

The literature reveals confusion in regard to a classification of odors. A traditional system lists four classifications: acid, burnt, fragrant, and caproic. These classes of odors have implications for learning event design in that learners will vary discretely in their ability to name, match, and categorize odors. For maximum learning effectiveness and efficiency, each learner should be able to name, match, and/or categorize the four classes of odors.

Some odors act as anesthetics for some olfactory receptors. This gives rise to the phenomenon of even the foulest stench, or the most permeating aromas, becoming less noticeable.

Recovery refers to the amount of time necessary for the olfactory receptors to regain lost sensitivity as a result of exposure to anesthetic odors. One hour is a standard time taken by most people in regaining lost sensitivity.

When a learner is seldom successful in identifying a standard set of odors through naming, matching, or categorizing, or in sensitivity to specific odors, and/or when he requires longer than standard recovery time after intentional anesthesia, he can be said to be of low ability. Low ability is recorded as less than standard ability.

When a learner can name, categorize, or match a standard set of odors, and/or when he meets the standard recovery time for sensitivity after intentional anesthesia, he can be considered to have standard ability.

When a learner is successful in identifying specific odors through naming, matching, or categorizing a standard set of odors, and/or when he requires less than standard recovery time after intentional anesthesia, he can be considered to be of high ability.

Figure 3.4 illustrates the framework of the olfactory component of the superstructure of learner analysis.

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| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Identification | Naming | | | |
| | Matching | | | |
| | Categorizing | | | |
| Sensitivity | | | | |
| Recovery | | | | |
| | | | | |

Figure 3.4. Olfactory

## SAVORY

For maximum learning effectiveness and efficiency, each learner should be able to name, match, and/or categorize four classes of taste.

### Sourness

A taste that has only acids as activators will be sour. Specifically, the more hydrogen ions a solution has, the sourer the taste will be.

### Sweetness

Many compounds of different chemical compositions activate a sweet taste. The most common sweetness activators, however, are sugars. Some lead salts, saccharine, cyclamates, and d-asparagine are sweet taste activators.

### Saltiness

Sodium chloride (table salt) has the purest salty taste and is unique in this respect because most soluble inorganic compounds have several tastes in various combinations.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Identification | Salt | | | |
| | Sweet | | | |
| | Sour | | | |
| | Bitter | | | |
| | | | | |

Figure 3.5. Savory.

## Bitterness

Many chemically different compounds have a bitter taste. The more bitter tastes are alkaloids like caffeine, nicotine, quinine, and brucine.

There are six factors that affect taste: specifically, adaptation, fatigue, concentration, temperature, tongue area, and solutions sometimes have more than one taste. Odor and taste are senses which were not fully understood as were the senses of hearing and vision. They were, therefore, more difficult to evaluate. In recent years, highly sophisticated instruments and chromatograhic techniques have been developed which promise to make future evaluations of odor and taste more accurate.

## TACTILE

Tactile discrimination is the ability to analyze the characteristics of solid or liquid matter within the limits of the physical properties of the matter.

## Rough

An uneven textural condition of matter within which component particles can be detected but cannot be definitively perceived.

### Irregular

A textural condition of matter within which component particles can be detected but cannot be definitively perceived.

### Smooth

A textural condition of matter within which component particles can neither be detected nor definitively perceived.

### Slippery

A textural condition of matter which permits, more or less free, sliding.

### Tacky

A textural condition of matter which makes it adhesive to the touch.

### Hot

The condition of presence of heat within uncomfortable or intolerable ranges.

### Warm

The condition of presence of heat within tolerable ranges.

### Cold

The condition of absence of heat within uncomfortable or intolerable ranges.

### Rigid/Flexible

A condition of matter which allows it to yield to the touch, but, which allows the matter to return to its original shape.

### Malleable

A condition of matter which allows it to yield to the touch and does not allow it to return to its original shape.

### Mobile

A condition of a substance which allows it to be moved to new positions without return.

### Oscillatory

A condition of substance which allows it to be moved to new positions but return to its original position when the force is removed.

### Static

A condition of a substance which denies movement to new positions.

### High Viscosity

A condition of a substance, usually a liquid, in which resistance to flow is distinctly perceivable.

### Low Viscosity

A condition of a substance in which resistance to flow is not perceivable.

### Wet

A condition in which a substance is covered saturated, or consists of, a liquid.

### Moist

A condition in which a substance contains, or is covered with, a discernable liquid.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Discrimination | Rough-irregular-smooth | | | |
| | Slippery-tacky | | | |
| | Hot-warm-cold | | | |
| | Rigid-flexible-malleable | | | |
| | Mobile-oscillatory-static | | | |
| | High-low Viscosity | | | |
| | Wet-moist-dry | | | |

Figure 3.6. Tactile.

### Dry

A condition in which a substance is not covered, not saturated nor does it consist of a discernable liquid.

## PROPRIOCEPTIVE

Not only do learners react to stimuli originated outside the body and perceive meaning from these stimuli, but a learner also reacts to stimuli arising within his body. The ability to detect and interpret degrees of bone-joint angulation, change of angulations, muscle stretches, and tendon tensions contribute to the process of learning when learning events are contrived and based upon the degree of ability the learner possesses. The proprioceptive sense applies most frequently to psychomotor learning. It may, however, influence, to more than minimal degrees, affective learning, and is even conceivable to be a significant part of cognitive learning.

### Muscle Spindle

A muscle spindle is a nerve ending in a muscle which detects the degree of extension beyond ordinary extremes.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Kinesthetics | Angulation of the Joints | | | |
| | Rate of Change of Angluation of Joints | | | |
| Spindle | Muscle Extension | | | |
| | Muscle Contraction | | | |
| Strength of Muscular Contraction of Golgi Tendon | | | | |
| | | | | |

Figure 3.7. Proprioceptive.

## Kinesthetics

Kinesthetics is the degree of angulation of the joints and the rate of change of angulation of the joints.

## Golgi Tendon

The golgi body in a tendon is a nerve ending which detects the degree of tension applied to a muscle in either contraction or extension applied to a muscle by means of the degree of contraction or extension.

## KINESTHETIC

The kinesthetic sense is mediated by end organs located in muscles, tendons, and joints, and stimulated by body movements. The body derives a sensory experience from this sense, and thereby, perceives meanings through stimuli.

Kinesthetic versatility consists of the ability to interpret the contraction or extension of single muscle movements. In the performance category, kinesthetic versatility consists of the ability to execute contraction or extension of single muscles. In the creative category, kinesthetic versatility consists of the ability to use contraction and extension of single muscles to perform functions in innovative ways.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Interpretation** | **Versatility** | | | |
| | **Accuracy** | | | |
| **Performance** | **Versatility** | | | |
| | **Accuracy** | | | |
| **Creativity** | **Versatility** | | | |
| | **Beauty** | | | |
| | | | | |

Figure 3.8. Kinesthetic.

Kinesthetic accuracy is the ability to interpret or perform the contraction, or extension, of single muscles in the execution of an act.

Kinesthetic beauty is the ability to contract or extend a single muscle or a necessary combination of muscles with smoothness within limitations of time and space.

## READING

The act of reading is a component of the process of learning for most learners. Too often, the learner is expected to read at a given level (and thereby perceive meaning through the symbols of reading) without regard to his current reading ability. Consequently, the learner may be asked to read at a level above, or below, his ability.

Reading at a level which is other than appropriate for a given learner more often results in the generation of frustration than in the desirable generation of motivation and enthusiasm.

An appropriately designed learning event will incorporate the specific reading level of the learner for that event, and will, thereby, boost his motivation and enthusiasm. For purposes of contemporary education and for effective participation in most of life's activities reading is a primary input of information, recreation, and perhaps even therapy. It is important that reading abilities be analyzed and repaired or refined as appropriate.

The rate, usually stated in words per minute, at which a learner reads, is usually referred to as his speed.

The rate of comprehension is shown by the learner's ability to summarize, or outline, what the author said—to get the main ideas of a passage and the subordinate details, to distinguish essential details from those that are incidental or unimportant. Comprehension also requires ability to see relationships such as comparisons, contrasts, and time sequences; to read between the lines, and to sense the author's tone, mood, or intention in writing the material; and to evaluate what the writer had to say. In essence, comprehension consists of the learner's ability to treat any body of content by recall and demonstrating relationships between parts.

The reading sophistication of a learner is denoted by his ability to interpret terms and symbols on a scale consisting of a continuum between the concrete and the abstract.

The ability of the learner to separate the relevant from the total task constitutes his filtration competency. This necessitates a determination of the learner's ability to filter concrete information, concrete ideas, and concepts.

Iconic representations are made up of charts, diagrams, maps, concrete pictorial representations. The reading competence in iconic representations is implemented by the visual literacy of the learner. His competence is dependent on his ability to scan the visual and make sense of its various parts.

| | | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|---|
| Speed | | | | | |
| Comprehension | | | | | |
| Sophistication | Interpretation of Terminology | | | | |
| | Interpretation of Symbology | | | | |
| | Synthesis of Terms and Symbols | | | | |
| Filtration Competency | Ability to Filter concrete Information | Irrelevant to Concrete | | | |
| | | Abstract to Concrete | | | |
| | Ability to Filter Concrete Ideas | Ideas to information | | | |
| | | Ideas to Application | | | |
| | Ability to Filter Concepts | Comcepts to ideas to Information | | | |
| | | Concepts to Application | | | |
| Competence in Reading Iconic Represent-ations | Charts | | | | |
| | Diagrams | | | | |
| | Maps | | | | |
| | Concrete Pictorial Representations | | | | |
| | Abstract Pictorial Representations | | | | |

Figure 3.9. Reading.

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The independent reading level is the level at which the learner reads effectively on his own without extrinsic assistance or intervention. This level is recorded on the profile as standard.

The instructional reading level is the highest level at which the learner reads under teacher supervision, without signs of difficulty. This level is recorded on the profile as greater than standard.

The frustration reading level is the level at which the learner is blocked by inadequate phonic skills, inadequate visual literacy, lack of information, or the inability to think about what he is trying to read. This level is recorded on the profile as less than standard.

## WRITING

Effective learning incorporates the process of communication. Communication dictates an interaction between, and among, people. Interaction includes writing as well as other communicative acts. Appropriately designed learning events take into account the fact that learners have different degrees of skill in writing, and enables the learner to utilize his specific degree of skill optimally.

Legibility is the condition of being capable of being read or deciphered plainly and easily. It refers to the ability of the writer to write in some style, printing or cursive. It does not refer to his composition or communication abilities.

A learner's vocabulary consists of a stock of words he is capable of employing semantically, with accuracy, in his writing.

Semantic interpretation refers to the ability of a learner to write in such a manner that the reader can infer intended meaning from his written language.

The format versatility utilized by a learner in his writing refers to the general plan of organization and the degree to which he can change, or modify, this general plan of organization. Elements include spelling accuracy, sentence structure, paragraph coherence, and a simple: complex ratio in length of sentences, use of polysyllable words, semantic necessity, and esthetic literality.

## COHERENCE OF PRESENTATION

The coherence of presentation refers to the systematic connection of legibility, vocabulary, semantic interpretation, and format versatility in logical presentation. Coherence of the transmission of intended meanings is at the center of a coherent presentation.

| | | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|---|
| Legibility | | | | | |
| Vocabulary | Level | | | | |
| | Sophistication of Application | | | | |
| | Connotative Fluency | | | | |
| Semantic Interpretation | | | | | |
| Format Versatility | Spelling Accuracy | | | | |
| | Sentence Structure | | | | |
| | Paragraph Coherence | | | | |
| | Simple:Complex Ratio | Length of Sentences | | | |
| | | Use of Polysyllable Words | | | |
| | | Semantic Necessity | | | |
| | | Esthetic Literality | | | |
| Coherence of Presentation | Transmission of Intended Meanings | | | | |
| | Difficulty of Interpretation | | | | |
| | Ambiguity Index | | | | |

Figure 3.10. Writing

## COGNITIVE LEARNING SKILLS

Learning skills and strategies are held by learners to varying degrees which affect the effectiveness and efficiency of learning, Included are note taking, test taking, problem solving, group participation, and library skills and strategies. Events of learning not based on the degree of skill held by any learner will make any learning that takes place accidental, rather than by design, in nature.

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| | | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|---|
| Note Taking | | Note Taking | | | |
| | | File System | | | |
| | | Recovery System | | | |
| Test Taking | | Item Interpretation | | | |
| | | Response Organization | | | |
| Problem Solving | Interpretation of Problem | Conditions | | | |
| | | Resources | | | |
| | | Results Potentials | | | |
| | Organization of Resources | Discovery | | | |
| | | Isolation | | | |
| | | Application | | | |
| Group Participation | | Discussion | | | |
| | | Brainstorming | | | |
| | | Buzz Sessions | | | |
| | Consultation | With Expert | | | |
| | | As Expert | | | |
| | | Classes and Seminars | | | |
| | | Experimentations | | | |
| Library | Card Catalog | Author Cards | | | |
| | | Title Cards | | | |
| | | Subject Cards | | | |
| | | Fiction Cards | | | |
| | | References | | | |
| | Reader's Guide | Author Index | | | |
| | | Subject Index | | | |
| | References | Encyclopedias | | | |
| | | Dictionaries | | | |
| | | Atlases | | | |
| | | Compendiums | | | |
| | | Who's Who's | | | |
| | | Almanacs | | | |

Figure 3.11. Cognitive Learning Skills.

## COMPUTATION

Computation is a skill that is important in many learning acts, especially to problem-solving involving quantity. Computation ability is a part of the general education curriculum of the philosophies endorsed by most schools. It is important to analyze computation ability to assure that learners have entry skills at whatever level they are needed.

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| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Addition** | **One Digit Numbers** | | | |
| | **Multiple Digit Numbers** | | | |
| **Subtraction** | **One Digit Numbers** | | | |
| | **Multiple Digit Numbers** | | | |
| **Multiplication** | **One Digit Numbers** | | | |
| | **Multiple Digit Numbers** | | | |
| **Division** | **Long Division** | | | |
| | **Short Division** | | | |

Figure 3.12. Computation.

Computation is the act of computing a sum, difference, product, or quotient of two or more numbers. Addition is the mathematical operation of combining numbers so as to obtain a sum. Subtraction is the mathematical operation of deducting one number from another so as to obtain a difference.

Multiplication is the mathematical operation that is an abbreviated process of adding a number to itself a specified number of times so as to obtain a product.

## DIAGRAMMATIC PLANNING

Symbols have meanings when the meanings are perceived by the learner. These meanings are perceived to varying degrees and at varying rates. Diagrams are symbols, and therefore, have meanings when they are perceived by their users. Communication is an integral component, in the process of education, and communication takes place between, and among, interactors. To convey, and sometimes receive, meanings from symbols, it is sometimes necessary to construct diagrams. Appropriate learning event design needs to be formulated in the light of the fact that learners vary in degree of skill in constructing diagrams.

The ability of a learner to create diagrams from reality, or from intellectual concepts, constitutes his diagrammatic planning ability.

The aspects of dimension of a structure which convey meaning to the learner include length, width, height, and depth perception, and perspective design.

Any structure is likely to have components and sub-components. The intimacy, or closeness, of these parts and sub-components can affect aspects of dimension, proximity, inference, and manipulation.

Elements of some diagrams may be constructively invisible. They may require the learner to make valid assumptions about structure. Propositions can be arrived at by the learner by noting the intimacy of main components, by deduced elements, and by induced elements.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Aspects of Dimension** | **Length** | | | |
| | **Width** | | | |
| | **Height** | | | |
| | **Depth** | | | |
| | **Perspective** | | | |
| **Aspects of Proximity** | **Intimacy of Parts** | | | |
| | **Intimacy of Sub-components** | | | |
| **Aspects of Inference** | **Intimacy of Main Components** | | | |
| | **Deduced Elements** | | | |
| | **Induced Elements** | | | |
| **Aspects of Manipulation** | **Balance-imbalance** | | | |
| | **Flexibility-rigidity** | | | |
| | **Static-fluid** | | | |

Figure 3.13. Diagrammatic Planning

In diagrammatic planning the aspects of planning to which the learner must allude include the ratios of balance-imbalance, flexibility-rigidity, and static-fluid.

## DIAGRAMMATIC INTERPRETATION

Symbols have meanings when the meanings are perceived by the learners who use them. Like diagrammatic planning, these meanings are perceived to varying degrees and at varying rates. Diagrams are symbols, and therefore, have meanings when they are perceived by their users. Communication is an integral component, in the process of education, and communication takes place between, and among, interactors. To convey, and sometimes receive, meanings from symbols, it is sometimes necessary to interpret diagrams. Appropriate learning event design needs to be formulated in the light of the fact that learners vary in degree of skill in interpreting diagrams.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Aspects of Dimension** | **Length** | | | |
| | **Width** | | | |
| | **Height** | | | |
| | **Depth** | | | |
| | **Perspective** | | | |
| **Aspects of Proximity** | **Intimacy of Parts** | | | |
| | **Intimacy of Sub-components** | | | |
| **Aspects of Inference** | **Intimacy of Main Components** | | | |
| | **Deduced Elements** | | | |
| | **Induced Elements** | | | |
| **Aspects of Manipulation** | **Balance-imbalance** | | | |
| | **Flexibility-rigidity** | | | |
| | **Static-fluid** | | | |

Figure 3.14. Diagrammatic Interpretation

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Aspects of Dimension | Length | | | |
| | Width | | | |
| | Height | | | |
| | Depth | | | |
| | Perspective | | | |
| Aspects of Proximity | Intimacy of Parts | | | |
| | Intimacy of Sub-components | | | |
| Aspects of Inference | Intimacy of Main Components | | | |
| | Deduced Elements | | | |
| | Induced Elements | | | |
| Aspects of Manipulation | Balance-imbalance | | | |
| | Flexibility-rigidity | | | |
| | Static-fluid | | | |

Figure 3.15. Structure Analysis

## STRUCTURE ANALYSIS

To convey, and sometimes receive meanings from symbols it is sometimes necessary to analyze the structure of the symbols. Appropriate learning events need to take into account the fact that learners vary in degree of skill in analyzing the structure of symbols in diagrams.

## SPEAKING

The process of education directly involves the process of communication and communication directly involves education. The process of communication directly involves the act of speaking and speaking directly involves communication. Speaking is a process of sign production (oral) that has a common meaning conveyed between, or among, interactors. Yet speakers vary in their ability to speak. Instruction, designed irrespective of the nature of a learner's speaking ability, is ineffective, inefficient, confusion-generative, and generally unproductive.

Projection describes the ability of the learner to throw, or cast forward, a verbal discourse so as to communicate vividly with his audience as a result of his volume and range of sound levels.

The articulation of vowels determine the general quality of the voice and the articulation of consonants shape words and make them intelligible. With proper articulation, speakers are easy to understand and make it pleasant to listen to them.

The precision of a speaker is constituted by the level, fluency, versatility, denotative and connotative accuracy of his vocabulary, and by the chord quality, word quantity, polysyllabic frequency, and complexity of structure in economy.

*Level.* The level of the vocabulary utilized by a speaker can be determined by the position of the vocabulary usage in any designated scale. Typically, the scale used for vocabulary level has been one indicating age, or in instances, grade (year) in school.

*Fluency.* Speaking void of halting, hesitant speech is usually considered fluent; also, if a speaker is certain, avoids awkward pauses, repetitions, false starts, and clumsy phrasings, he can be considered fluent.

*Versatility.* The vocabulary versatility utilized by a speaker refers to the degree to which he can change, or modify, his general plan of vocabulary usage.

*Denotative and connotative accuracy.* Meaning is of two general kinds: (1) denotative (intellectual) and (2) connotative (emotional). Denotative meaning is characteristic of the language of science; it is the accurate, dictionary meaning of words. Connotative meaning is characteristic of the language of art; its' meaning is based on the experiences of the individual, and its' meanings can be different for everyone. The criterion implies the ability of the learner to use each kind of meaning appropriately.

*Word quantity.* Word quantity in economy refers to the efficient usage of words; superfluous words are limited or non-existent.

*Word quality.* Word quality in economy refers to the effective usage of words; the chosen word(s) convey the message better than any other word(s).

*Polysyllabic frequency.* Polysyllabic frequency refers to usage of words containing more than two syllables. In many instances, a polysyllabic word will convey a more accurate meaning than does several words for the same meaning.

## Style

A learner's style of speaking is determined by his interest index, pace presentation, and length of bits and pieces.

*Interest index.* The color:monotony ratio determines the interest index. Color in speaking is characterized by a vividness, or variety, of effects of language; monotony is characterized by a lack of vividness, or variety, of effects of language.

*Pace.* The pace of presentation in speaking refers to the rate at which the speaker proceeds through informational bits.

*Length.* The length refers to the size of the informational bits.

Learners vary in their willingness and desire to participate in speaking. Learners can be classified as being either eager, cue-oriented, or reticent.

*Eager.* An eager speaker is marked by keen, enthusiastic, or impatient desire.

*Cue-oriented.* A cue-oriented speaker is one who is motivated by a specific signal for a specific speech.

*Reticence.* A reticent speaker is one who is restrained in expression and inclined to be silent or secretive.

## Distractibility Index

The concentration, idea traffic, and participation:confusioin ratio determine the distractibility index.

*Concentration.* Concentration is the ability to direct one's attention to a single objective.

*Idea traffic.* The pace, quantity, and quality of ideas that emerge from one's thought processes constitute idea traffic.

*Participation-confusion.* The ratio between perplexity and taking part in speaking activities.

## Ability

When a learner is seldom successful in the use of any, or all, components of the speaking process, he can be considered to have low ability (less than standard). If he is successful in any, or all, components of speaking process at levels required by the learning event, he can be considered to have standard ability. If he is successful in any, or all, of the components on a continuous basis, he can be considered to have high ability.

| | | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|---|
| Projection | | | | | |
| Enunciation | | | | | |
| Precision | Vocabulary | Level | | | |
| | | Fluency | | | |
| | | Versatility | | | |
| | | Denotative and Connotative Accuracy | | | |
| | Economy | Word Quantity | | | |
| | | Word Quality | | | |
| | | Polysyllabic Frequency | | | |
| Style | Interest Index | Color Motonony | | | |
| | | Pointed Abstract | | | |
| | Pace | | | | |
| | Length | | | | |
| Partic-ipation Format | Eager | | | | |
| | Cue-oriented | | | | |
| | Reticent | | | | |
| Distract-ability Index | Concentration | | | | |
| | Idea Traffic | | | | |
| | Participation-confusion | | | | |

Figure 3.16. Speaking

## LISTENING

Listening is a process of sign reception (aural) that has a common meaning conveyed between, or among, interactors.

Listening concentration is the ability to achieve an intentional isolation of a single sound source from the many aural stimuli besieging the learner. It is used to maintain an interest span.

Organization is manifested by note-taking activity, frequency and nature of question-asking activity, and the extrapolation of summaries during and after listening.

The effective and efficient listener can comprehend the main ideas form a discourse, can ignore confusion and distraction, and can present an accurate recall of the oral discourse.

The effective and efficient listener can comprehend the main ideas from a discourse, can ignore confusion and distraction, and can present an accurate recall of the oral discourse.

*Noise.* In communications theory, noise is interpreted to be anything which diverts, distorts, or disrupts the message.

*Dialect.* A regional variety of a spoken language, or a jargon, for instance, as associated with occupations or peer groups; or a language considered as a part of a larger group of language, for instance Spanish and French are Romance dialects. Penetration of a dialect means to ignore the ramifications of the dialectically structured message to perceive the intended content.

*Confusion.* Confusion is a state in which order, or sense, is not a condition of the message.

*Interceptions.* Interceptions are conditions or events which stop or interrupt the progress of the message and tend to disrupt the continuity and contiguity of the development of the message. These interceptive conditions are also referred to as "noise."

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Concentration | Interest Span | | | |
| | Apparent Interest | | | |
| Organization | Note-taking Activity | | | |
| | Question-asking Frequency | | | |
| | Extrapolation of Summaries | | | |
| Filtration | Comprehends the Main Ideas | | | |
| | Ignores Confusion and Distractors | | | |
| | Can Present Accurate Recall | | | |
| Interpretation | Counters Noise | | | |
| | Penetrates Dialect | | | |
| | Makes Sense out of Confusion | | | |
| | Ignores Interceptions | | | |

Figure 3.17. Listening.

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## SYNNOETICS

Most social scientists agree that a learner's environment has as much, or more, effect upon the development of psychomotor, cognitive, and affective aspects as heredity has upon these aspects. Each learner varies in his ability to interpret his relationship to his environment, adapt to his relationship, or refine either or both optimally. Instruction should be geared to the degree to which the learner interprets, adapts, or refine his relationship to his environment.

Synnoetics is the ability to interpret one's relationship to one's environment and to revise, adapt to, or refine either, or both, optimally.

A learner has a role in society and this role can be defined in terms of the leadership, followership, or degree of membership searching the learner exerts upon society. The result is a position, or rank, in relation to others. Leadership can be defined as a state, or condition, of participating in various social activities contributing innovative applications of social situations and providing deductive and inductive motivation to other participants. Followership can be defined as a state, or condition, of participating in social activities with participation as motivated by leaders. Membership searching can be defined as a state, or condition, of continually searching for membership in groups that the learner feels enjoys a higher social status than the highest ranking group of which he is presently a member.

The position, or rank, one holds in relation to others in a system of politics constitutes one's political status.

*Non-participation.* A member of the society ho takes no active part in the conduct of government, either vicariously, as in the case of most learner participation, in civic, state, and national political affairs, and possible vicarious non-participation in the case of school governmental activities.

*Moderate participation.* A member of society whose life frame is focused in major part on the political activity in the conduct of government.

*Leadership.* The condition of participating in various organized political activities, in either a worker or office holder role, contributing innovative applications on political theories and principles and providing deductive and inductive motivation to other participants. In the case of real civic governmental events, the influence of the learner's family structure and peer groups is to be taken into consideration. In the case of school government, the learner may, or course, provide more or less intense leadership.

Ideology is a set of beliefs about the proper order of society and how the proper order can be achieved. The position, or rank, one holds in relation to others in a system of religion constitutes one's religious status.

Non to irregular attendance to organized activities constitute this type of participation.

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One who attends various organized religious activities with only covert participation is an active observer.

One who participates in various organized religious activities contributing innovative applications or religious theories and principles and providing deductive and inductive motivation to other participants demonstrates leadership.

The position, or rank, one holds in relation to others in a family constitutes one's family status. A member of a family group who operates alone to create and strengthen family unity can be considered to be solitary. A member of a family group who takes no part in family activities is non-participatory. A member of a family group who takes part in family activities on a continuous basis is an active participator. One who participates in family activities contributing innovative applications of family welfare and providing deductive and inductive motivation to other family members demonstrates leadership.

| | | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|---|
| Social Status | Leadership | | | | |
| | Followership | | | | |
| | Membership Searching | | | | |
| Political Status | Non-participation | | | | |
| | Moderate Participation | | | | |
| | Active Participation | | | | |
| | Leadership | Worker | | | |
| | | Office Holder | | | |
| | Ideology | | | | |
| Religious Status | Non to Minimal Participation | | | | |
| | Active Observer | | | | |
| | Followership Participation | | | | |
| | Leadership | | | | |
| Family Status | Solitary | | | | |
| | Non-participation | | | | |
| | Active Participation | | | | |
| | Leadership | | | | |

Figure 3.18. Synnoetics.

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## ETHNIC

Race, religion, and nationality are frequent bases for social differentiation in society. Since the school and the processes of education, are typically societal functions, these differentiations effect what teachers are trying to teach, to whom, to what degree and why any given event should be learned.

If the designer of the learning event can identify and interpret the influencing ethnic concepts and interactive behaviors of others, as they relate to his own, then a learning event that is relevant can be appropriately designed. Too, the motivation of a learner, when these conditions are taken into account, is boosted, and thereby increases the efficiency and effectiveness of the event.

The term ethnic group is used to designate groups that are differentiated from a dominant group in the same society primarily on cultural grounds, whether or not other bases of differentiation, such as race, religion, or nationality are also present.

Attitudes one may hold that are directed toward an ethnic group include the attitude of curiosity. One may be curious as to who and why a member of the ethnic group is. One will greet the ethnic group member and not arouse defense mechanisms and mores against him. The perceiver will hold a secret air of superiority while being sympathetic toward this helpless person(s). The perceiver will likely be protective of the minority person.

Attitudes one may hold that are directed toward an ethnic group include the attitude of economic welcome. The minority group member is welcomed into the labor market and given equal opportunity in business ventures as well as economic employment.

| | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|
| **Curiosity** | | | |
| **Economic Welcome** | | | |
| **Social Antagonism** | | | |
| **Fair Play** | | | |

Figure 3.19. Ethnic.

Attitudes that one may hold that are directed toward an ethnic group include the attitude of antagonism. Through either sporadic or organized movements, vicious propaganda is spread against the minority member; the majority member is prejudiced toward the minority member, and as a result, discriminates in social relationships.

Attitudes one may hold that are directed toward an ethnic group include the attitude of fair play. Friendships with minority members, economic opportunities, broadminded attitudes, and a sense of equality prevails.

A learner is considered to be rejective when, overtly, his activities appear to repel, reject, antagonize, or otherwise demonstrate various degrees of hostility to ethnic groups other than his own. It is recorded on the profile as less than standard.

A learner is considered to be neutral, or covert, when his activities, in relation to ethnic groups other than his own, are non-existent, or unobservable. It is recorded on the profile as standard.

A learner is considered to be acceptive when his activity, in relation to ethnic groups other than his own, cannot be discriminated from his relationships with his own ethnic group. It is recorded on the profile as greater than standard.

## FAMILY

The family is a social institution that, in many instances, is the primary cultural determinant. The family can be small and simple in size, organization, or norms; or, it can be large and complex. Individuals within the structure function to varying degrees in family activities, unity, and influence. The influence of the family, and the role the learner plays within the family, is projected into the school situation. The identification and interpretation of the family organization and practices of the learner, as they relate to one's own, will facilitate appropriately designed learning events.

A family member whose life frame is focused in major part on family activities and family unity is totally committed. It is recorded on the profile as greater than standard.

A family member whose life frame is focused on family participation and family unity only at times when he is selfishly concerned or times of crisis is intermittently committed. It is recorded on the profile as standard.

A family member who takes no interest in family activities or family unity is uncommitted. It is recorded on the profile as less than standard.

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| | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|
| Non-participation | | | |
| Solitary | | | |
| Followership Participation | | | |
| Leadership | | | |
| | | | |

Figure 3.20. Family.

## RELIGION

It is important that the designer of the learning event identify and interpret the influencing religious concepts and practices of others, as they relate to his own, because the learner's behaviors are influenced by religion. Society achieves its unity through the possessing by individuals of specific values and goals. As a result, a powerful control over conduct is exercised, guiding it along lines subservient to institutional structures and conforming to ultimate values and goals.

Religion is an organized system of beliefs and rituals centering on a supernatural being or beings. The practice of religious beliefs and rituals as they relate to all aspects of living is considered continuous. It is recorded on the profile as greater than standard. The practice of religious beliefs

| | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|
| Minimal Participation | | | |
| Active Observer | | | |
| Followership Participation | | | |
| Leadership | | | |
| | | | |

Figure 3.21. Religion.

and rituals as they relate to specific aspects of living, when convenient to the practice is considered intermittent commitment. It is recorded on the profile as standard.

A person who has no systematic application of religious and/or beliefs to aspects of living is uncommitted. It is recorded on the profile as less than standard.

## PEER

A learner's behaviors influence, and are influenced by, his peer group. As a member of a peer group, a learner has expectations imposed upon him by societal norms and groups with which he interacts. He may be a leader, follower, or non-participant. He may be totally committed, intermittently committed, or uncommitted to peer group activities and/or unity. Motor skills, cognitions, and especially, affects, are influenced by peers.

A peer group is a group considered to be one's equal in terms of interest, qualification, association, or station in life.

A peer group member whose life frame is focused in major part on peer activities and peer unity is totally committed. It is recorded on the profile as greater than standard.

A peer group member whose life frame is focused on peer group participation and peer unity only at times when he is selfishly concerned of times of crisis is intermittently committed.. It is recorded on the profile as standard.

A peer group member who takes no interest in peer group activities or peer group unity is uncommitted. It is recorded on the profile as less than standard.

|  | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|
| **Non Participation** |  |  |  |
| **Solitary** |  |  |  |
| **Followership Participation** |  |  |  |
| **Leadership** |  |  |  |
|  |  |  |  |

Figure 3.22. Peer.

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## MORES

Folkways have their origin in the instinctual drives of mankind, that is, the basic task of life, to live. Men begin with acts, not thoughts. Every moment brings necessities that must be satisfied at once. Need was the first experience. Analogy makes it easy to assume that the ways of ancestors had produced channels of habit and predisposition along which dexterities and other psychophysical creativities would run easily. All adopted the same way for the same purpose based on other's experiences; then the ways turned into customs and became mass phenomena. The young learned customs by tradition, imitation, and authority. Folkways were uniform, universal in the group, imperative, and invariable. As time goes on, the folkways become more and more arbitrary, positive, and imperative. Folkways become coercive. All are forced to conform, and the folkways dominate societal life. Then, they seem true and right, and arise into mores as the norm of welfare. As a result, faiths, ideas, doctrines, religions, and philosophies, arise.

The mores are the folkways, including the philosophical and ethical generalizations as to societal welfare that are suggested by them, and inherent in them as they grow.

Mores are norms that the group defines as essential to social welfare and that are strongly sanctioned. Institutions and laws are produced out of mores.

### Political Mores

Political mores are codes related to the conduct of government in the making, execution, and interpretation of laws.

### Social Agencies Mores

Within the body and activity of social agencies a set of influences tend to generate mores, such as sportsmanship, camaraderie, and in a specific instance, the Boy Scouts of America hold to a creed that a scout is trustworthy, loyal, helpful, friendly, courteous, kind, cheerful, thrifty, brave, clean, and reverent.

### Religion Mores

An organized system of beliefs and rituals centering on a supernatural being or beings constitutes a religion. Religious mores usually provide a creed for daily life activities such as Judeo-Christian virtues and ethics.

## Family Mores

The family is the basic unit in society having as its nucleus a patriarch, matriarch, or both, and whose primary purpose is to rear their own or adopted children. Mores would include such things as intra-family unity, inter-family interactions, and family interaction with society.

## School Mores

A group of learners and teachers pursuing knowledge constitutes a school. Mores are developed such as enthusiasm for learning, respect for individuals and groups, and cultural transmissions.

## Military Mores

The military is considered to be any or all branches of the armed forces. Mores are developed such as loyalty to country, branch of service, duty, and honor.

| | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|
| Family | | | |
| Peer | | | |
| Social Agencies | | | |
| School | | | |
| Religion | | | |
| Political | | | |
| Military | | | |

Figure 3.23. Mores.

### Peer Mores

A peer is a person considered to be one's equal in terms of interest, qualification, association, or station in life. Mores are developed such as group loyalties and intro-group interactions, group interactions, and societal interactions.

A learner is considered to be totally committed to a set of mores when his entire life activities are based on the moral framework. It is recorded on the profile as greater than standard.

A learner is considered to be committed intermittently to a system of mores when his concern for self tends to neutralize his moral concerns. It is recorded on the profile as standard.

A learner is considered to be uncommitted when his life activities are apparently ego-centric or when his moral commitments are covert. It is recorded on the profile as less than standard.

## SOCIAL AGENCY

Social agencies are instruments of the citizens of the community. The agency represents the organized efforts of groups of people, or individuals, to meet the specific needs of people which arise out of social conditions. The social agency is a non-profit institution which operates with the support of the people it serves. Social agencies have been variously classified as being character building, welfare oriented, leisure time groups, recreational, informally educational, youth oriented, or in combinations of these classifications. Within the body and activity of such social agencies a set of influences tend to generate mores, such as sportsmanship and camaraderie.

| | | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|---|
| Participant | As Client | Character Building | | | |
| | | Group Work | | | |
| | | Leisure-time | | | |
| | | Recreational | | | |
| | | Informal Education | | | |
| | | Youth-serving | | | |
| | As Volunteer Worker | Character Building | | | |
| | | Group Work | | | |
| | | Leisure-time | | | |
| | | Recreational | | | |
| | | Informal Education | | | |
| | | Youth-serving | | | |
| | | | | | |

Figure 3.24. Social Agency.

A participant is a learner who benefits directly or indirectly from social agencies as either a client, a volunteer, or vicariously through a family member, peer, or teacher. A person who seeks or engages in the services of a social agency is a client. A person who provides a service without remuneration through a social agency is a volunteer worker.

## POLITICS

Man's perceptions influence, and are influenced by, his culture. A part of a learner's culture is composed of politics. Politics is constituted by the process of government, especially in the conduct of making, executing, and interpreting laws.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Non-participation | | | | |
| Moderate Participation | | | | |
| Active Participation | | | | |
| Leadership | Worker | | | |
| | Office Holder | | | |
| Political Ideology | | | | |
| | | | | |

Figure 3.25. Politics.

This process of government affects the learner vicariously through family and/or acquaintances, as can be the case in civic, state, national, and international affairs, or directly, as can be the case in school government.

### Politics

The process of government, especially the conduct of making, executing, and interpreting laws, constitute politics.

### Leadership

The condition of participating in various organized political activities, in either a worker of office holder role, contributing innovative applications on political theories and principles and providing deductive and inductive motivation to other participants.

## KINESICS

As previously demonstrated, the learning process is enhanced by ability to communicate. In addition to the aforementioned skills, the ability to com-

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| Interpretation | Versatility | | | |
| | Acccuracy | | | |
| | | | | |
| Performance | Versatility | | | |
| | Accuracy | | | |
| | | | | |

Figure 3.26. Kinesics.

municate by means of nonlinguistic functions and motions of the body, such as shrugs, gesticulations, and gestures is an integral component. Yet, learners vary in the degree to which they are able to communicate kinesically. Instruction designed not taking these differences into account is considered to be inefficient, ineffective, and any learning that takes place does so by chance.

## PROXEMICS

Each learner projects physical and social distances between himself and others in the act of communicating. Learners vary in the ability to judge and penetrate these distances, and, vary in their ability to extend their own personal fields to optimal limits. Learning events should be designed so as to allow the learner to operate optimally in his own field in relation to others.

Proxemics describes the ability of a learner to judge acceptable, critical, physical, and social distances which influence him, and as his physical and social distances influences others.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Interpretation** | **Acccuracy** | | | |
| | **Frequency** | | | |
| | | | | |
| **Performance** | **Judgement** | | | |
| | **Recovery** | | | |
| | | | | |

Figure 3.27. Proxemics.

## TRANSACTIONALS

Learners vary in the ability to maintain a positive communicative interaction which significantly influences the goals of others involved in that interaction. This is especially salient when prescribing the modality of instruction for any given learner. For example, a learner with greater than standard ability in transactionals likely would find modes of instruction that involve leadership as a primary task, or opportunity, to be particularly relevant.

Transactional are defined to be the conditions which expose the ability of the learner to maintain a positive influencing interaction with others.

### Moderator

The learner participates as a moderator when he is the obvious leader of the group. His leadership may range through various extremes. One of the extremes is dominance. As a dominant moderator the learner would tend to influence group decisions and activities almost entirely. Neutrality, as a moderator, is a condition in which the moderator conducts the development of group decisions and activities without influencing them in any way. Persuasion, as a moderator, is a condition in which the moderator influences group decisions and activities by means of argument, reasoning, or entreaty, without dominance.

Active participation is a condition in which the learner exercises a direct positive influencing interaction with others in a continuous way. A passive participant is one demonstrates little or no overt transactional activities. A negative participant is one whose transactional influences tend to divert, confine, or counteract the apparent intentions of others.

A catalytic agent is a participant whose activities tend to initiate, modify, or stimulate the activities of others. The catalytic agent does not appear to enter into the actual activities of others.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Moderator** | **Dominance** | | | |
| | **Neutrality** | | | |
| | **Persuasion** | | | |
| **Participant** | **Active** | | | |
| | **Passive** | | | |
| | **Negative** | | | |
| **Catalytic Agent** | **Self-motivation** | | | |
| | **Group Organizer** | | | |
| | **Idea Activator** | | | |
| **Iterpretation of Roles** | **Self** | | | |
| | **Others** | | | |
| | **Role Description** | | | |

Figure 3.28. Transactionals.

## ETHICS

Learners are committed to varying degrees to a set of values, a group of principles, obligations, and/or duties. This commitment need not imply a morality. Both a minister and a convicted criminal may be committed to a set of values even though the values are decidedly different.

| | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|
| Inter-personal Relationships | | | |
| Group Relationships | | | |
| Inter-group Relationships | | | |
| Religious systems | | | |
| National Responsibilities | | | |
| State Responsibilities | | | |
| Civic Responsibilities | | | |
| Community Responsibilities | | | |
| Political Systems | | | |
| Moral Systems | | | |
| Social Agency Responsibilities | | | |
| | | | |

Figure 3.29. Ethics.

## EMPATHIC

Learners vary in the ability to identify with, or have a vicarious experience of, another person's feelings, ideas, or volitions. Empathy can be defined as the capacity for participating in another's feelings or ideas. It includes the identification of points of view help by the learner, by identification of the learner's ability to determine his own points of view, and the identification of the learner's ability to determine points of view held by others.

Open mindedness dictates that the empathizer not make value judgments or moral decisions about the points of view or behaviors exhibited by others, and that the learner be receptive and unprejudiced toward ideas expressed by others.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Identification of Points of View** | | | | |
| **Open Mindedness** | | | | |
| **Attentiveness** | **Completeness** | | | |
| | **Thoroughness** | | | |
| **Stimulating Feedback Production** | | | | |
| **Accuracy** | | | | |
| | | | | |

Figure 3.30. Empathic.

## ESTHETICS

Esthetics describes the ability to receive and interpret situations, products, and ideas in terms of the beauty or pureness of their character. Typically, educators and learners have considered only "art" as having esthetic value. But, a learner may find beauty, or pureness, in a task performed will, in an idea, or in a form of government. Pureness is the quality in situations, products, and ideas that make them untainted, unmixed, spotless, unalloyed, and in general free from what vitiates, weakens, or pollutes. Beauty is the quality in situations, products, and ideas that give pleasure to the senses or exalts pleasure to the spirit.

| | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|
| Paintings | | | |
| Sculpture | | | |
| Woodwork | | | |
| Music | | | |
| Literature | | | |
| Poetry | | | |
| Commercial Product Designs | | | |
| Sociological Conditions | | | |
| Anthropological Conditions | | | |
| Recreational Events | | | |
| Discussions, Lectures, Seminars | | | |
| Dance | | | |
| | | | |

Figure 3.31. Esthetics.

## HISTRIONICS

Histrionics can be described as the ability to observe, interpret, or perform a staged behavior, or a deliberate exhibition of emotion or temperament, apparently intended to have a deliberate effect on others. Genuine behavior is that which is free from hypocrisy or pretense. Artificial behavior applies chiefly to emotions or states of mind not naturally caused nor spontaneously aroused; these behaviors are usually considered to be feigned, assumed, affected, stilted, imitated, synthetic, facetious, and cunning.

| | | Standard | Less than Standard | Greater than Standard |
|---|---|---|---|---|
| **Interpretation** | **Genuine Behavior** | | | |
| | **Artificial Behavior** | | | |
| **Performance** | **Genuine Behavior** | | | |
| | **Artificial Behavior** | | | |
| **Dramatic Analysis** | **Theatricals** | | | |
| | **Documentaries** | | | |
| | **Literature** | | | |

Figure 3.32. Histrionics.

## IMPLICATIONS

For too long many educators have been attempting to teach without answering some basic questions concerning their program of instruction. Specifically, what are teachers trying to teach, to whom, to what degree, how does one know when it has been learned, and perhaps most importantly, why should it be learned? Under these conditions the learning that takes place is considered by many to be accidental and comes about regardless of the ineffectual efforts of the teacher.

A necessary characteristic of a learning event which has the capacity for producing professional accountability, that is, one which can be validated, is that it be designed to suit the needs of the learner. It is not possible to design learning events adequately until one has some comprehensive measurement of the learner's needs. To get such a measurement, a technique of analysis is mandated. The results of analysis provide diagnostic and prescriptive data which guide learning event.

We are living in a period of development when yesterday's ideas and methodologies of teaching are swiftly becoming obsolete; today's ideas and methodologies will obsolete tomorrow. To keep abreast of this change, we must be versatile to the limits of the need, be aware that he change is inevitable, and make the necessary behavioral adjustments.

The more thoroughly the learner's needs and the teaching-learning process are understood, the more educators realize the need for a continuing program of developmental evaluation, validation, and change ranging from changes of a minor nature to replacement of entire methodologies.

## CHAPTER 4

# LAYOUT AND DESIGN

Instructional design has been described by theorists as a primarily visual process. These theorists contend that to be an effective instructional designer, one must think visually. Instructional designers need to convert archetypes to paradigms, and paradigms to models—a visual process.

Sardonically, professionals in the field of instruction state that it takes 25 years for a novel idea or technique to filter into general use. By that time, the original idea or technique has been so modified that it is unrecognizable.

During the past 30 years, and before, the writers have observed professional instructors at all levels, kindergarten through graduate school, for prolonged periods of time, in various parts of the United States. Rather than the rule, it has been the exception to find instructors who had adequate support in media design and production. Rather than the exception, it has been more like the rule to find instructors who made and used instructional media without apparent awareness of standards of visibility, and even less knowledge or concern for effective layout and design incorporating the principles contained in "Perception and Visual Literacy" discussed in Chapter 2 of this book. In recent times software for the microcomputer has enabled instructional designers to do bad visuals more quickly and more easily. The ignored art, or craft, has become even more greatly ignored. Regardless of the medium—the traditional slide, poster, or bulletin board, or the more exciting World Wide Web presentation—principles of layout and design must be followed to be effective.

Obviously, this is a criticism of the profession. It is not intended as a criticism of the professionals. The lack of awareness, the lack of knowledge or

INSTRUCTIONAL DESIGN: SYSTEM STRATEGIES, pages 135–163
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concern, and the lack of design and production skills is the result of a point of vacuum in the training of professionals. Even more so, it is a lack of awareness by boards of education and administrators of what it takes to have the greatest amount of effect with the largest number of students in the first years of the twenty first century.

At this point in your study of instructional design, you have developed skills and knowledge in the following areas: you have an operational knowledge of general systems theory and of instructional design; you can conduct a needs assessment culminating in the establishment of an instructional goal; you can do a task analysis; you can operationalize tasks thereby converting them to objectives; you can select and integrate commercially prepared media into your instructional design; and you can facilitate learner activities leading to goal and objective achievement. All of these steps can be done within a constructivist learning theory paradigm. You have studied perception and visual literacy. Now you are going to learn general principles of layout and design for visuals to be integrated into your instructional design.

Once learners have accepted a rationale for learning, they learn effectively when a variety of media is used with effect on several of their major senses. When the content of a medium is comprehensible only with major difficulty, the medium is more likely to repel than to attract. The cost of such media is not expensive, considering only the cost of the materials required to make them. The cost of such media is enormous, however, in terms of the wasted man-hours that are spent in their preparation. The cost to the profession is phenomenal. Not only are such media incapable of producing the results possible with media that are correctly designed, but their ineffectuality will probably drive the instructor back to use techniques that might just as well be performed by a mediocre tape recorder.

The real point of concern is, in any case, the effect of media on learners. When learning results are mediocre or otherwise unfulfilled, the cost in educated people is astronomical. Appropriately designed media tend to produce taxpayers, rather than the propagation of tax consumers.

All of us learn all the time. All of us learn through experience. All of us experience all the time. Most of what we learn is retained only briefly. We retain what we learn more or less permanently only when we accept it as worthwhile, review it from time to time, and use it for some purpose we deem to be important, interesting, or otherwise satisfying.

Experiences come to us in more or less random kinds and from more or less random sources. When the experiences are perceived, the reception is through one or more of our senses.

The majority of our experiences are composed of sights and sounds: Eighty-three percent of our experiences are received by sight. Eleven percent is received by listening. Seeing is increasingly effective in relation to

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our visual literacy. Sounds are increasingly effective in relation to our ability to listen and convert sounds into cognition.

When experiences are selected, designed, and appropriately arranged, learners can be exposed to them by means of a variety of techniques. One of the techniques contains five steps:

1. Lecture over a specified content,
2. Assign activities,
3. Study material,
4. Recite, and
5. Test.

This is, of course, a more or less traditional format. Given criteria guidelines, the process could be conducted by means of an audiotape playback instrument, and, certainly by means of a videotape playback instrument, appropriate note sheets, and proctors.

A more versatile arrangement of experiences employs:

1. **SHOWING** in whichever order more clearly corresponds to telling,
2. **TELLING** whatever the objectives to be learned are,
3. **DIRECTION** of learners to practice,
4. **SUPERVISION** of practice to reduce errors and make unlearning unnecessary,
5. **PERFORMANCE** within criteria, and
6. **EVALUATION** of performance relative to the criteria that correspond to the objectives of learning.

Behavior develops in quality and quantity. Which comes first depends on how experiences and consequent practices are arranged. The target behavior is more likely to develop when stimuli are designed appropriately for the objectives of learning and when responses and practices are directed and supervised.

The rate of learning and the ability to manipulate data, to construct concepts, to gain indicator behaviors that lead to genuine affective qualities, and to gain psychomotor skills with precision, sophistication, and increasing abstraction establish and increase in quantity and refine in quality in relation to the following:

1. The effective design of the experience, including directives to pertinent practice, time to practice under expert supervision, time to demonstrate that learning occurred, and reinforcement by knowledge of results.
2. The acceptability by learners of the rationale.

3. The appropriateness of the level of experiences, and
4. Placement of the experiences on the concrete-abstract continuum.

Dr. Edgar Dale of Ohio State University arranged experiences on what came to be known as the Cone of Experience. At the base of the cone, concrete experiences were assumed to be. At the apex of the cone, the more abstract experiences were assumed. The most concrete kind of experience, according to Dr. Dale, was shown to be the direct purposeful experience. Verbal symbols were assumed by Dr. Dale to be more abstract. By inspection of each of the levels of the cone, it can be seen that experience is likely to be a combination of visuals and sounds. It is possible, of course, to have visuals without sounds. It is also possible to have sounds without visuals, but, other than radio and sound recordings, all other experiences imply visuals and do not necessarily imply sounds.

The base of the cone can be seen to have a greater dimension than any of its companion levels. The dimensions of each of the levels can also be

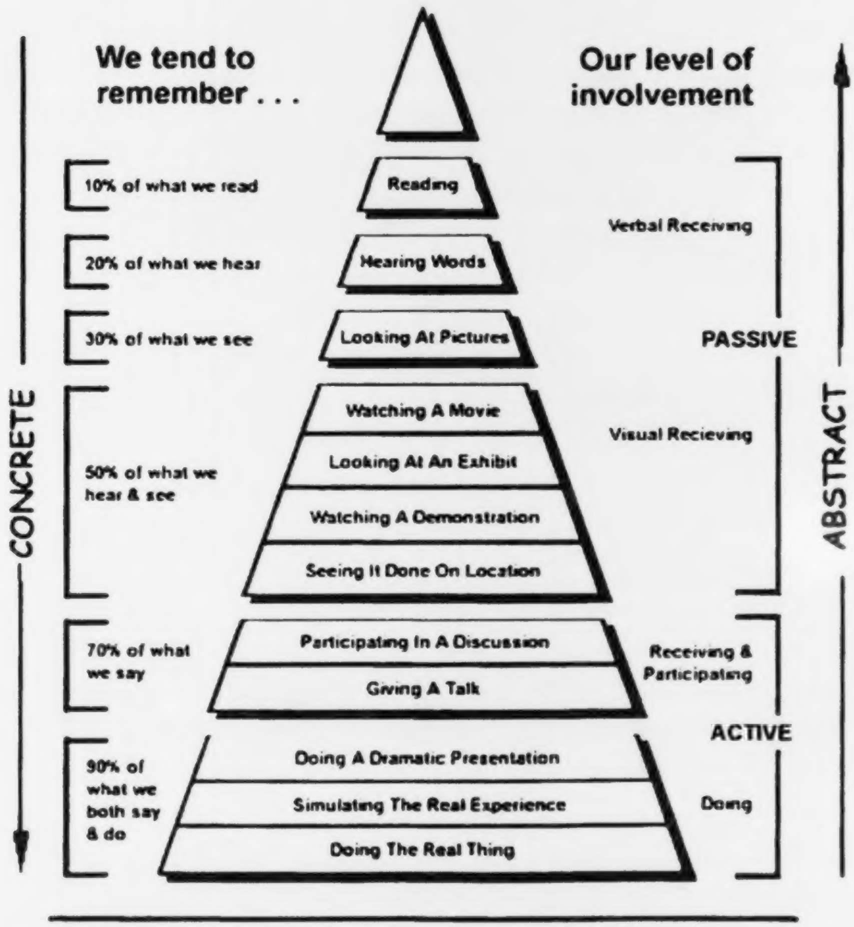
We tend to remember . . .
Our level of involvement
10% of what we read
Reading
20% of what we hear
Hearing Words
30% of what we see
Looking At Pictures
Verbal Receiving
PASSIVE
50% of what we hear & see
Watching A Movie
Looking At An Exhibit
Watching A Demonstration
Seeing It Done On Location
Visual Recieving
70% of what we say
Participating In A Discussion
Giving A Talk
Receiving & Participating
ACTIVE
90% of what we both say & do
Doing A Dramatic Presentation
Simulating The Real Experience
Doing The Real Thing
Doing
CONCRETE
ABSTRACT

Figure 4.1. Dale's Cone of Learning

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assumed to be indicative of the scope, the depth, and the variety of experiences that are likely to occur at that level, relative to any of the other levels. Most experiences, for instance, can be arranged to be at the level of the direct and purposeful. There are some, such as the demonstration of a disassembled turbine, which cannot. There are many possibilities for field trip experiences, but, for some learners, field trips into some of society's shortcomings might be too dangerous.

There are five main categories of visuals:

1. Real objects (realia)
2. Models
3. Mock-ups
4. Motion media, and
5. Still media.

**REAL OBJECTS** include anything that is animal, vegetable, or mineral that occurs in nature, or that is fabricated.

**A MODEL** is a representation of a real object. It may be in high magnification, or in its real size, or miniaturized. Models may be static, as for example, a piece of statuary, a model of a building, a model of a bridge, or even a model of a geographical feature. Models may also be operable, such as a model of a locomotive, or a functioning model of a heart, or, a model of a factory of some kind.

**A MOCK-UP** is like a model, except that is usually a section of a real object, and it works as the real object works.

**MOTION MEDIA** include motion pictures, video (by television or computer), and computer animations.

**STILL MEDIA** include any still visual image, opaque or projectable, regardless of size.

Visual images may include the following:

1. Pictorial counterparts of anything, real or imagined, natural or fabricated.
2. Symbols that are coded representations of real or imagined, natural or fabricated objects, and
3. Verbals, which are really symbols of anything, real or imagined, natural or fabricated.

Pictorial counterparts can be contrived as one of the positions on the concrete to abstract continuum. Beginning at the concrete end of the continuum, and ranging to the abstract, visual positions may be conceived as the following:

1. Full color stereographic photographs.
2. Full color photographs.
3. Continuous tone black and white (gray scale) photographs.
4. High detail full perspective color drawings.
5. High detail full perspective black and white (gray scale) drawings.
6. High contrast line drawings.
7. Outline diagrams.
8. Cartoons.

Still media may be portrayed on any surface that will accept a static line, mass, or texture. When a still medium is on a transparent surface of appropriate size, it can be backlighted, or projected onto surface that will reflect it.

Visual images can be arranged for display on the horizontal plane, or on the vertical plane. On either plane, displays can be two-dimensional, or three-dimensional. The horizontal plane is more versatile on the three-dimensional display level.

The horizontal display makes use, in many cases, of both—the horizontal display surface and the vertical display surface.

The horizontal display surface is useful for the following:

1. Convention display booths,
2. Museum displays,
3. Fairs, and
4. Public information displays.

The vertical plane is found in several formats:

1. Chalkboards.
2. Bulletin boards.
3. Magnetic boards.
4. Flannel boards.
5. Peg boards.
6. Hook and loop boards.
7. Posters.
8. Wall displays.
9. Projection surfaces.
10. Permanent display panels.

The meanings for the verbals, the symbols, and the pictorial counterparts used in a visual are in the mind of the beholder. It does not matter what the source, the designer, or the transmitter of the message means by the parts that make up the visual. To achieve a response effectively, the only thing that makes a real difference is what the receiver (the audience, the learner) means by what he sees in the visual. To know with even the most minimal certainty what a specific audience means by the parts of a visual, the designer must analyze the target audience with as much penetrative perceptivity as he can muster.

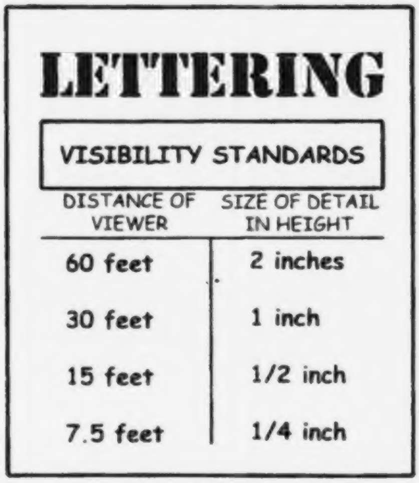
Accurate interpretation of the elements of a visual display requires that the viewer be able to see them visibility of a visual is influenced by these characteristics:

1. Abstractness of imagery and the ability of the viewer to interpret
2. Style of lettering,
3. Mode of lines,
4. Size of relevant details,
5. Mode of backgrounding, and
6. Coloring.

Acuity of visibility is achieved when viewers can perceive and resolve each pertinent detail of a visual, and how each detail relates to and interacts with other details in the same field. The ordinary classroom is usually about 30 feet in depth. Some viewer is almost always at the extreme depth. The usual small auditorium is about 60 feet in depth. It must be assumed that when such a space is put to use, part the audience will be at the extreme viewing distance.

When a viewer is 60 feet away from a visual, opaque or projected, any significant detail on the visual needs to be, at minimum, two inches tall.

When a viewer is 30 feet away from a visual, opaque or projected, any significant detail on the visual needs to be, at minimum, one inch tall.



LETTERING

VISIBILITY STANDARDS

| DISTANCE OF VIEWER | SIZE OF DETAIL IN HEIGHT |
|---|---|
| 60 feet | 2 inches |
| 30 feet | 1 inch |
| 15 feet | 1/2 inch |
| 7.5 feet | 1/4 inch |

Figure 4.2. Visibility Standards

When a viewer is 15 feet away from a visual, opaque or projected, any significant detail on the visual needs to be, at minimum, one-fourth inch tall.

To achieve any of these minimum viewing sizes, several factors relate to each other. The factors are visual field or projection screen size, the aspect ratio of the visual, and the image size on the opaque or projected field.

To achieve an adequate image on an opaque field, one needs only to make the significant detail within minimum limitations of size. To achieve adequate image size on a projected visual, a guideline for the preparation of artwork is useful. The artwork preparation guideline is related to the aspect ratio of the visual, regardless of whether the visual is to be a 2-inch by 2-inch slide, a filmstrip, an overhead transparency, a televised image, or whatever. The significant detail should occupy 1/25 of the space in the aspect ratio, horizontally, vertically, or both.

When such a transparency is projected onto a surface that is four feet square, and fills the surface, a detail that occupies 1/25 of the aspect ratio of the field on the transparency will appear on the screen as an image that is 1.92 inches tall. This presumes, of course, that since the screen is filled, the projector must be at the appropriate distance from the screen, and the lens used is of the appropriate focal length.

An image that is 1.92 inches tall satisfies and exceeds the minimum requirement for a 30-foot viewing distance. It should be kept in mind that significant images on projected visuals have both height and width. The image on the transparency, therefore, should occupy 1/125 of the space by its width, as well as by its height, to be clearly perceived.

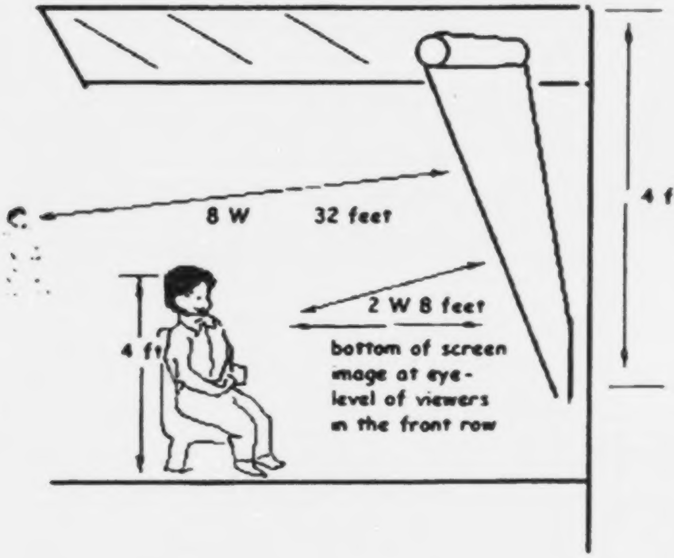

8 W
32 feet
4 ft
2 W 8 feet
bottom of screen image at eye-level of viewers in the front row
4 ft

Figure 4.3. Projection requirements.

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When a viewer is at the extreme depth of an ordinary classroom, about 30 feet from an opaque surface or from a projection surface, the field of the surface in either case ought to be no smaller than four feet square. In a classroom of this size, the front row of viewers ought to be seated no closer to the viewing surface, or the projection screen, than eight feet. In this case, eight feet is the equivalent of two widths of the screen.

One of the viewing problems in the ordinary classroom, or room that has a relatively flat floor, is that viewers in the first several rows tend to block the vision of viewers in the rows behind. One of the immediate ways to neutralize this blockage is to stagger the seats in each row. Another way to overcome the blockage is to provide pallets and stack them to tier the seating. Each stack of pallets should be six inches higher than the stack immediately before it. Also, the projector should be elevated so that the lowermost portion of its projected image is at the eye level of the viewers in the front row.

The actual opaque surface, or the projection surface, should be installed to be eight feet from the floor. To do this with a screen that is four feet high, the ceiling must be, obviously, at least eight feet high.

The projection surface ought to be mounted with its top edge eighteen inches from the wall. This will allow its lower edge to be drawn back to offset projection keystoning.

To avoid obstacle to the line of projection, illumination lights in the classroom should be flush-mounted in the ceiling. They should be fitted with directive diffusers to provide down lighting for response and practice. Illumination lights ought to be fitted with dimmer switches. The maximum viewing distance necessarily varies, depending on the size of the audience and the room in which the viewing occurs. From one environment to another, the screen size may change, the projector to screen distance may be restricted at one distance or another, and the available lens focal lengths may be restricted.

Unless appropriate visuals can be prepared whenever they are required, the size of the significant images that are required will determine the size of screen that is needed, and the maximum viewing distance that is tolerable. Knowing any two elements of the data, and using the template, one can determine the third when it is unknown. For example:

1. Knowing the screen size and the maximum necessary viewing distance establishes the necessary size of significant details.
2. Knowing the screen size and the size of letters or significant details that are on visuals establishes the maximum tolerable viewing distance.
3. Knowing the probable maximum viewing distance and the size of significant details on the visuals establishes the necessary size of the screen, and the projector-to-screen distance required to produce an image visible to the viewer at the maximum distance.

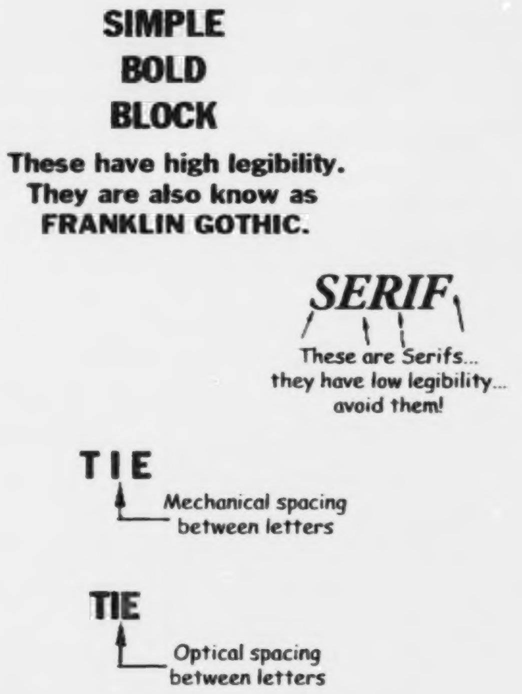
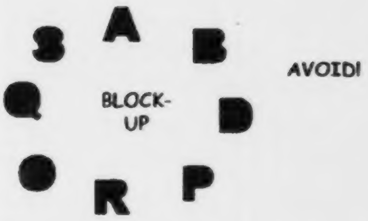

SIMPLE
BOLD
BLOCK
These have high legibility.
They are also know as
FRANKLIN GOTHIC.
SERIF
These are Serifs...
they have low legibility...
avoid them!
T I E
Mechanical spacing
between letters
TIE
Optical spacing
between letters

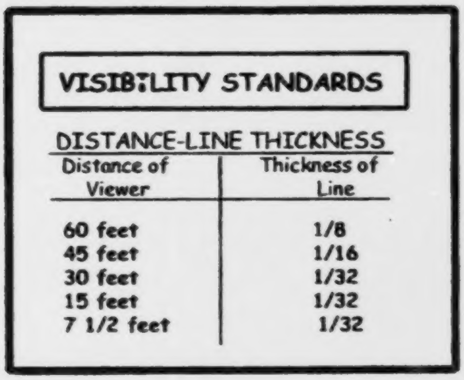
Figure 4.4. Optical legibility.

To assure that the verbals of a message on a medium have optimal legibility, research has disclosed that simple, bold, block letters are better. Old English letters, or any otherwise attractive letter style may lend beauty to the format of a visual, but they are not as clearly legible as block letters.

Further, to avoid confusion in legibility, it is wise to avoid the use of serifs on letters. Like other artistically designed adorned letters, those having serifs are attractive and have a pleasantness of design, but the serifs make the letters difficult to read, especially in relation to other letters. This is particularly true when they are viewed at a distance. Letters with serifs are also more difficult to produce.

The spacing of letters and the spacing between words in a visual also contribute to visibility. Mechanical spacing, that is spacing letters equidistant from each other, does not produce satisfactory results. Optical spacing is a more useful technique. In optical spacing, the important estimate is the volume of white area between any two letters. Each volume between two letters should be the equivalent of the volume between the two letters that precede and two letters that follow. To space words, the white area between the end letter of a word and the beginning letter of the next word should be about 1 1/2 times as much as the optical volume between letters between words. There are upper case letters, popularly known as capitals,





**VISIBILITY STANDARDS**

DISTANCE-LINE THICKNESS

| Distance of Viewer | Thickness of Line |
|---|---|
| 60 feet | 1/8 |
| 45 feet | 1/16 |
| 30 feet | 1/32 |
| 15 feet | 1/32 |
| 7 1/2 feet | 1/32 |

Figure 4.5. Visibility standards.

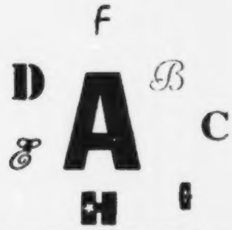
also lower case letters, popularly known as "small" letters. Upper case letters should be used sparingly.

If the thickness of the line used to make letters is too great, and the letter is not large enough, block-up may result. Avoid it, if possible.

At various distances of viewing, the visibility of lines is a matter of concern. At extreme distances, a line that is too thin may be anything from indeterminable to invisible. At 60 feet, line thickness ought to be 1/8 inch for clear perception. At 45 feet, line thickness can be reduced to 1/16 of an inch and be adequately visible. At 30 feet, the thickness of lines can be reduced to 1/32 of an inch and be visible. One and thirty-two hundredths of an inch is an optimal thickness to use at any closer distance.

Changes in the basic size and/or style of selected letters of verbals ought to be made rarely, if ever. When changes are made, they ought to be made boldly. The new letters selected should vary significantly in size or in style, preferably both. It is also useful to the attractiveness of format and the legibility of the visual to make a significant shift in position within the rule of thirds. When using color, it might also be useful to change the color to a complementary hue.

Grid patterns also influence visibility. When the lines of a grid are too close together horizontally and vertically, they tend to appear to the viewers, at distances exceeding resolution, as gray areas or mass blacks. Obviously, such blockages cause a loss of detail, and may even make a visual unintelligible.

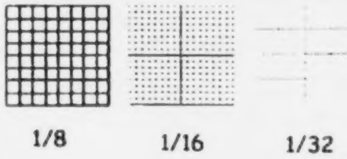


MAKE LETTER SIZE OR STYLE CHANGES RARELY. IF CHANGES ARE MADE--

**MAKE THEM BOLDLY!**

**VISIBILITY STANDARDS**

DISTANCE-GRID PATTERNS



| DISTANCE OF VIEWER | GRID PATTERNS |
|---|---|
| 60 feet | 1/8 inch |
| 45 feet | 1/16 inch |
| 30 feet | 1/16 inch |
| 15 feet | 1/16 inch |
| 7.5 feet | 1/32 inch |

Figure 4.6. More visibility standards.

At 60 feet of viewer-display distance, grid patterns should have interstices from top to bottom and from side to side of 1/8 inch. The interstices should be 1/16 of an inch when the viewer-display distance is 45 feet, and the same grid pattern can be used for viewer-distances of 30 feet and 15 feet. When the viewer-display distance is as small as 7 1/2 feet, a grid pattern of 1/32 of an inch can be used.

Symbols used with visuals display must also conform to the viewer-distance-size triad. When symbols are two-dimensional, the minimums apply to height and width. When symbols are three-dimensional, the added dimension of depth must be treated. In any case, it is the significant detail that must be treated, not only the major object.

At 3 1/4 feet, the detail should be 1/8 inch. At 7 1/2 feet, the detail must be 1/4 inch. Detail should be 1/2 inch and larger beyond 15.

A horizontal display consists of several elements, which are different from those of the vertical display. Both the horizontal display and the vertical display have the same composition of grounds, namely, foreground, mid-ground, and background.

The foreground, the mid-ground, and the background of the vertical display are usually more apparent than real. On the horizontal display, they can be employed with three-dimensional objects.

On a horizontal display, the attention of the viewer is, ordinarily, drawn first to the foreground. Unless there is unusual treatment, visual progression goes from the foreground to the mid-ground-to the background.

Attention can be drawn to the mid-ground or the background first by means of intense stimuli. A flashing light, motion, especially motion that is irregular, fluorescent colors, contrasty textures, or high contrast geometrics can be used to override natural visual progression.

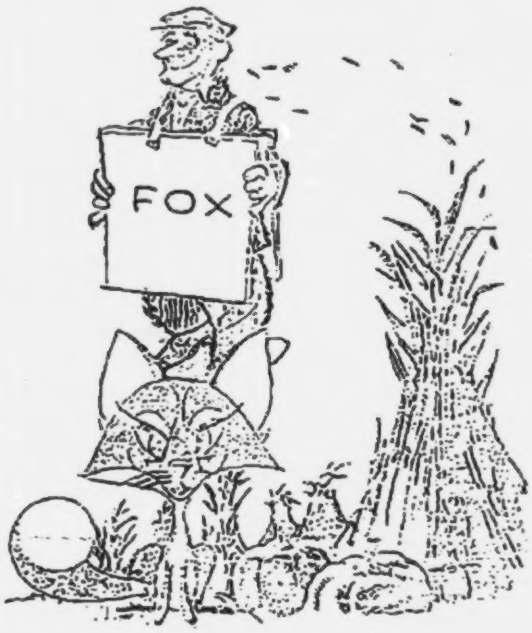


Figure 4.7. Eye direction.

On a vertical display the attention of the viewer may be drawn to the apparent grounds in the same order as for the horizontal display. The stronger impulse, however for the Occidental eye, is to move to the upper left of the visual, then to move to the right and downward to the lower right. When the attention reaches the lower right, the visual may lose the attention of the viewer unless a device for recapturing the eye, and recycling it, is part of the design.

The pictorial counterparts of a visual are placed in whatever sequence appears to be appropriate on the selected grounds. Pictorial counterparts may be installed in the visual field together with whatever verbals support the objective. Some visuals may use nothing but verbals to make their point.

To guarantee that viewers will perceive the visual as intended, directive devices should be strategically installed in the visual.

A visual, designed to make optimal use of its opportunities, includes these elements:

1. A means of attracting attention. It is laced, ordinarily, in the upper left quadrant of the visual field and actually or apparently in the foreground, no farther than the actual or apparent mid-ground.
2. A means of moving the eye of the viewer from the point of attraction to the next point relevant point. Ordinarily, the next relevant point

will be to the right of the attractor and slightly downward. Also, in an actual or apparent three-dimensional field, the eye can be moved one ground deeper or one ground more shallow; arrows, pointing fingers, staring eyes, a protrusion on an object, progressions of increase or decrease in size, color, tone, or geometrics can direct eye movement.

3. A means of emphasis of the critical elements of the visual. This emphasized can be accomplished by means of significant variations of color, tone, contrast, size, style, and use of back-grounding, pointers, or converging lines.
4. Effective isolation of significant elements within a coherent field. This can be done by using backgrounding of items, lines, or masses. Coherence can be achieved by using mass designs as back-grounding, arranging them so that their edge lines are directional.
5. The background of a visual should be planned and arranged to enhance the primary message of the visual. It should separate primary elements from subordinate elements while maintaining their coherence.

A visual is composed by including all of the elements within a space known as the field. The field includes all of the available space within the perimeters of whatever material one uses. It is the area of the material, that is, the height times the width.

A field can be oriented vertically so that it is taller than it is wide. The field can also be oriented horizontally, so that it is wider than it is tall.

The relationship between the height and width is called the aspect ratio. The aspect ratio ought to conform to whatever camera and projector are to be used.

In preparation, artwork for the 2 inch by 2-inch slides uses a ratio of 2 units by 3 units. Filmstrips require a ratio of 3 units by 4 units. Television employs a ratio of 3 units by 4 units. Overhead transparencies have an aspect ratio of 7 1/2 inches on to 9 inches, usually arranged on the horizontal plane. Vertical and horizontal displays use whatever space is available.

A visual which has the emphasis of its components placed at or near the center of its field is a condition of extreme or near extreme stasis. It is in almost total balance. It is the antithesis of dynamics.

For the viewer, it is difficult to achieve productive visual scan. It is even difficult to image stasis converted to motion. Moving the attentive eye of the viewer is less likely in a visual, which has stasis. Losing viewer attention is more probable, faster.

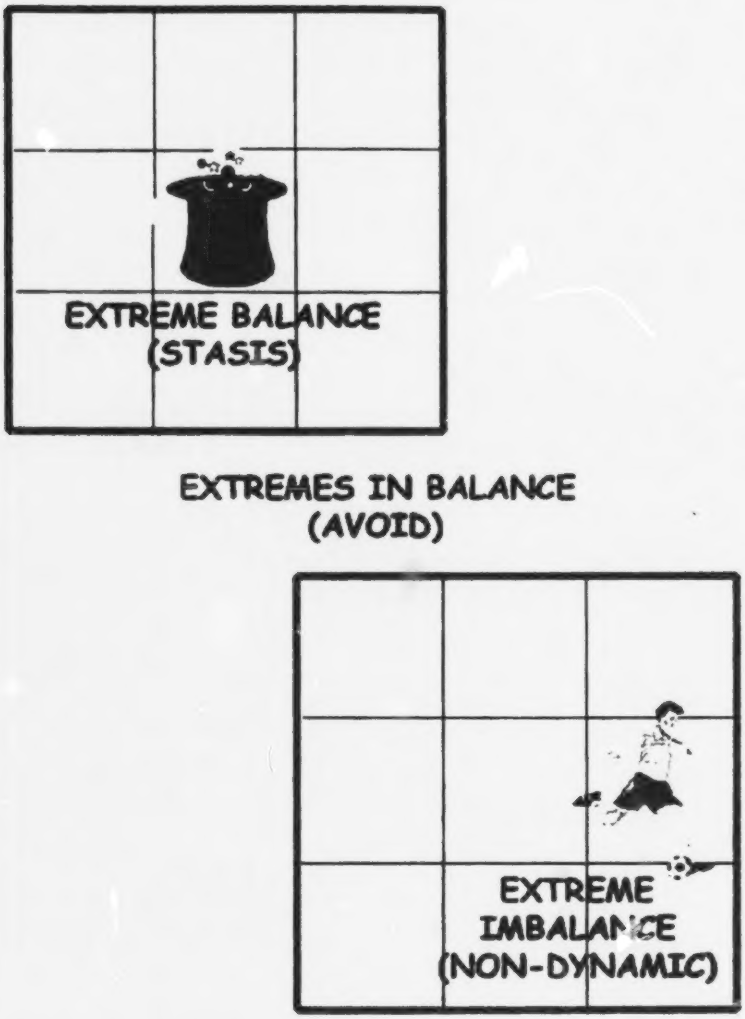


Figure 4.8. Balance.

A visual which has its main elements placed to the extreme sides, top, or bottom of the field in extreme imbalance. Viewers, in general, interpret such arrangements as giving the impression of uncertainty or insecurity.

In the absence of specific purpose, severe imbalance ought not be used in visuals. Imbalance is, however, one of the ways than eye-movement can be directed. Also, when the purpose is to achieve instability, or uncertainty, severe imbalance is a means of doing it.

Imbalance can be created by an irrational placement of mass. This too makes the viewer uncomfortable. Only with purpose should it be used.

With appropriate purpose indicating the need, imbalance can be created within the major visual field, or within subordinate visual fields. One of the more immediately conceived uses for imbalance within subordinate fields is to create eye-movement in sequences relevant to the major field.

A visual field can be divided into segments, horizontally and vertically. Two equally spaced horizontal lines and two equally spaced vertical lines divide the field into thirds on both planes. This imaginary division establishes the rule of thirds.

The dynamic points of a field are at the intersection of the lines. At the dynamic points, the motion potential of the visual is clockwise, along the lines, from upper left to upper right to lower right. Recycle can be achieved by putting directors at the lower right and the lower left. The closer attention is directed, or randomly drifts, toward the center of the field, the more stasis it generates. The farther from the dynamic intersections and their connectors attention is directed or drifts, the more imbalance it achieves.

A mnemonic device expresses a number of concerns, which produce more effective visuals. The device is "Successful Design Produces Better Visuals Helpfully." The first letter of each word is the key, that is, S,D,P,B,V,H. In turn, the words connected with the letters are the effective features of the visuals:

| | |
|---|---|
| 1. Successful | Simplicity |
| 2. Design | Dominance |
| 3. Produces | Pattern |
| 4. Better | Balance |
| 5. Visuals | Variation |
| 6. Helpfully | Harmony |

A visual ought to be correlated with a clear objective. An instructional visual is an outcome of an objective. The visual implements the objective.

Whether or not a visual is simple depends on the objective and the intricacy and complexity of the characteristic behaviors it educes. To some degree, whether or not a visual is simple is a subjective evaluation made overtly or covertly by the viewer. Whatever the level of simplicity must be, the designer of the visual should seek to make it as uncluttered and as relevant as his imagination and creativity will allow him to make it. When possible, as allowed by the implications of the objective, visuals related to it should present one unencumbered item of information.

For any given visual, simplicity includes the following:

1. A single concept, skill description, or indicator behavior motivator
2. Only those cues that are relevant to enable the viewer to deduce meaning by means of the symbols
3. Freedom from errors or inaccuracies
4. Avoidance of abstraction beyond the training of the audience.

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The elements of a visual that carry the primary message dominant in the total design. Each key element should be treated graphically to persuade attention and should be emphasized.

When key elements in a visual require the support of subordinate elements, directors ought to be used to move the eye in appropriate sequences.

If there is more than one key element, each should isolated and should be placed and related through the others for pertinent dominance.

The technique of dominance is used to attract attention to the elements of a visual in the order of their significance. The designer of the visual can make astute selections from the following:

1. Rule of thirds.
2. Pointers.
3. Color intensities.
4. Perspectives.
5. Contrast intensities.
6. Magnifications.
7. Texture variations.
8. Line of inspection.
9. Motion.
10. Light.
11. Size variation.
12. Style variation.

The arrangement of the visuals, the verbals, and the dominance techniques results in a pattern. The pattern is effective when it does the following:

1. Gets attention,
2. Directs attention,
3. Holds attention,
4. Insures meaning, and
5. Recycles attention.

The pattern must have, to be optimally which viewers have meanings which are the same as those of whomever the designed the pattern.

Any regular geometrical design provides a pattern that tends to control the eye. Geometric patterns provide eye control because their patterns are predictable to the viewer. When he knows the geometrical pattern, he has an expectancy of probability of where to look next.

Any letter of the alphabet provides a control pattern for the same reasons as geometrical patterns.

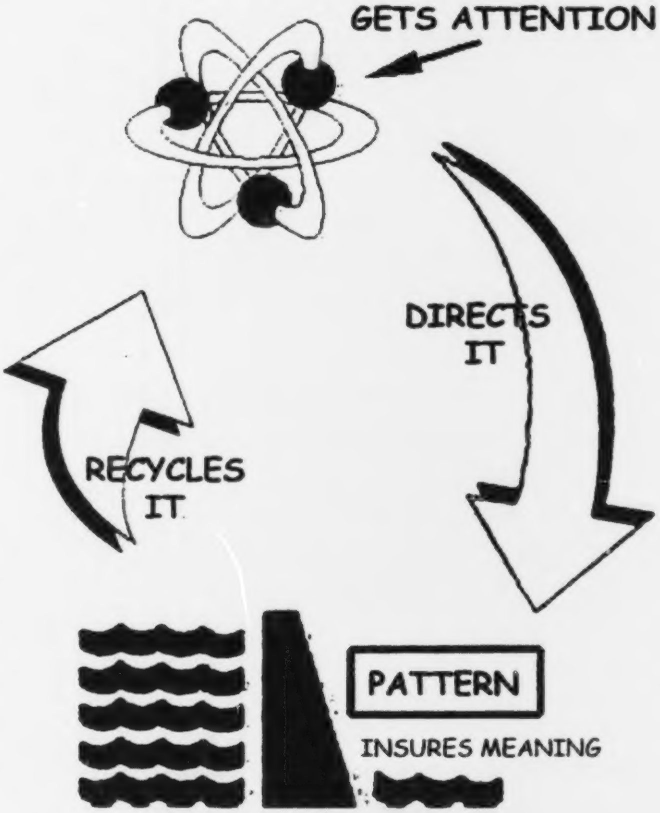


Figure 4.9. Pattern.

The design of a pattern is the plan for manipulation and arrangement of the basic elements. The basic elements include the following:

1. Verbal,
2. Pictorial counterparts,
3. Places on the field where there is something,
4. Places on the field where there is nothing. (this is called "white space," regardless of its actual color. It is a significant part of a successful pattern. There ought not be too little of it,
5. Directors.

Balance is another important factor in the design of a visual. Lack of balance creates a feeling of uneasiness, of uncertainty, even of lack of equilibrium in some viewers. Unless there is a clear and present need for lack of balance every effort ought to be made to achieve balance.

A balanced visual provides viewers with security and comfort. Viewers are more likely to look at balanced visuals, but to attempt to evade looking at visuals, which have poor balance.

Imbalance in design can be used with purpose to persuade eye movement.

To achieve balance, dark areas and large masses should be placed at or near the center of the field, preferably just slightly below the focal center and the horizontal center of the field.

The impression of balance is created, as are the other subjective aspects of a visual, as the response of viewers to the expectancies of the viewer. Generally, viewers expect large masses and dark masses to be heavier than small and light ones.

Variations in a sequence of otherwise similar design elements can attract attention and hold it long enough to generate cognizance. When variation in a design is unexpected, intensity of emphasis can be the result. The intensity of visual attractiveness, isolation, and emphasis can be provided by changing the following at pertinent places:

1. The shape of an object that is a visual target within a series of similarly shaped objects.
2. The size of an object within a series of objects that are similar in size.
3. The texture of an object in a series of objects of similar textures, or which are backgrounded by similar texture.
4. The color of an object within a series of objects of similar color the format of a line, differing from the rest of the line elsewhere in the design.
5. The position of an object within a series of similarly positioned objects.
6. The dimension of an object within a series of objects of similar contrast.
7. The organization of a group of objects within a series of similarly grouped or randomly grouped objects.
8. Variations of style, such as cartoons within photographs, photographs inset into cartoons, magnification insets, and the like.

The elements of a visual should provide for a continuity of the process of the development of related data, the formation of an indicator behavior, or the establishment of a psychomotor behavior. The visual should give the impression of a unified configuration.

Harmony is created when the eye and the mind can follow the layout of the visual smoothly, with predictable patterns, without sharp diversion, and in a more or less effortless fashion.

The first task of a visual is to attract attention to itself. Eastman Kodak research has shown that once the attention is achieved by a visual, it is maintained for about 12 seconds, after which it erodes at a rate described

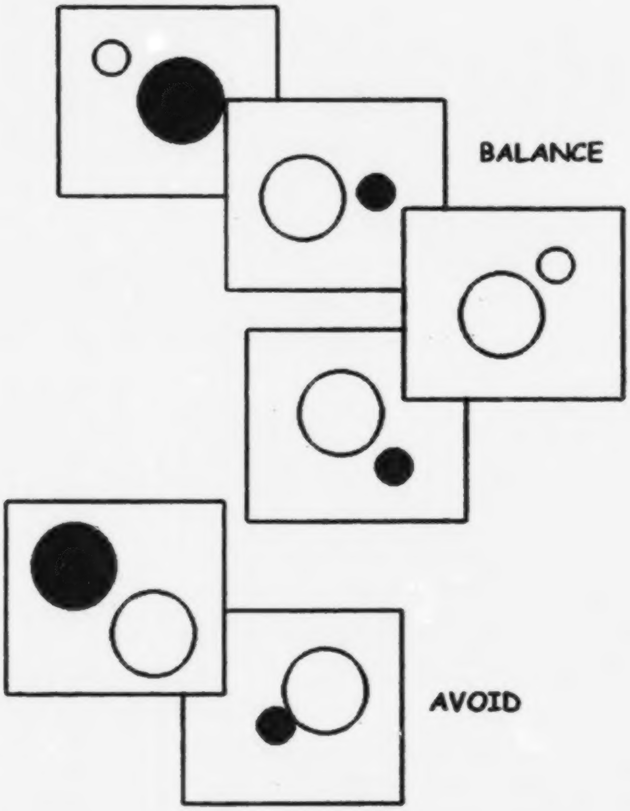


Figure 4.10. Harmony and balance.

by the deceleration curve. To renew the 12-second limitation, the visual should move the eye continuously to relevant parts of the field, in the sequence that is most appropriate to the message. The main object is to avoid loss of interest and attentive effort.

Attention can be attracted to pertinent visual elements by various techniques. Some techniques are included in the following:

1. By spotlighting.
2. The use of speculars.
3. By varying the intensity of lighting, colors, tones, or contrasts within the field.
4. By combining reality with line drawings or caricature.
5. By verbal directions on the visual, or in accompanying sound.
6. By framing significant elements.
7. By significant variations in backgrounds.
8. By pointers.
9. By motion, actual or simulated.

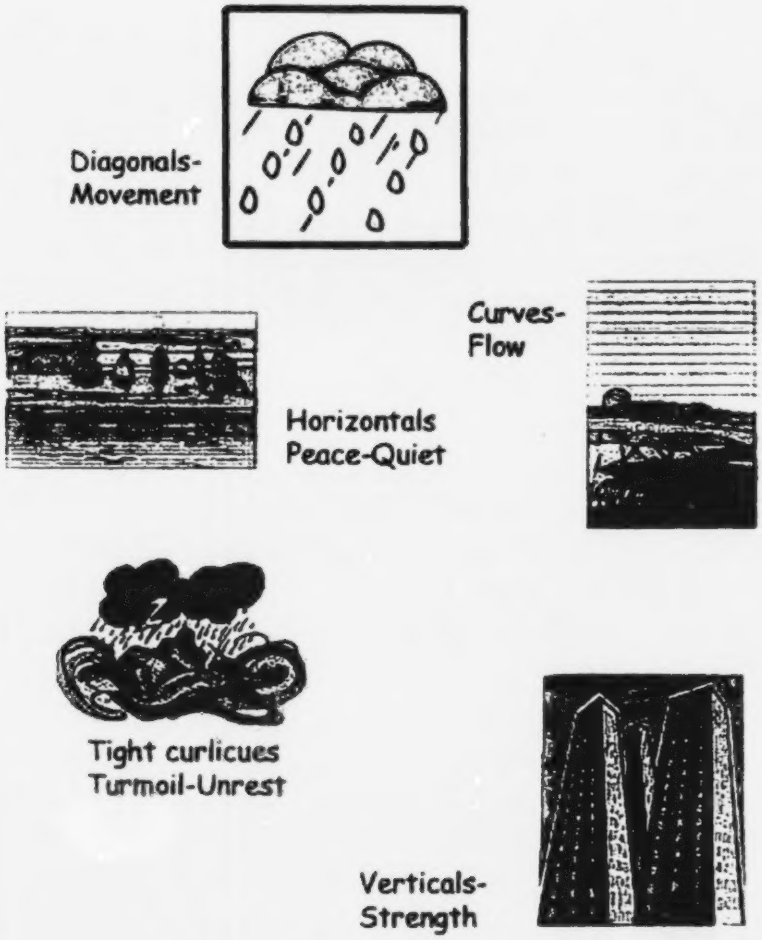

Diagonals-
Movement
Curves-
Flow
Horizontals
Peace-Quiet
Tight curlicues
Turmoil-Unrest
Verticals-
Strength

Figure 4.11. Lines and attitude.

Even the lines and consequently the attitude of the elements of a visual can create reciprocity of impression with viewers. Communication theorists, graphics technicians, artists, and others generally agree to the following:

1. Diagonal lines suggest motion.
2. Curves indicate flow, and the larger the curve, the slower the flow.
3. Vertical lines suggest strength.
4. In context, curlicues indicate turmoil, unrest.

In summary, visuals intended for behavior change are almost always composed using sets of significant elements. Categorically, the significant elements include the following:

1. A main image, which may be pictorial counterparts.
2. Verbals, or more abstract symbols, or correlated combinations of any.

3. Subordinate images, arranged in sequences.
4. Placement on the concrete-abstract continuum.
5. Colors, contrasts, textures, arranged to be used as attention-getters, eye-movers, recapturers, recyclers.

The elements of a visual should employ detail only in the amount necessary to configure the message to the viewer. Research has shown that the more abstract subsequent visuals should be for the learners who have previous knowledge and/or experience. When objects or ideas are novel to viewers, concrete visuals are more effective. Appropriate reduction of cues eliminates distraction and confusion for viewers when the cues are designed with skill.

The elements of a visual are the equivalents of the elements of a syntax. For example, the use of backgrounding includes the following purposes:

1. To set forth primary images.
2. To sequence images in the order of their importance.
3. To provide directors to control eye-movement.
4. To modify the meaning of images as intended by the designer.

The use of backgrounding is a subtle technique. It is more effective when it does its job without intruding on the awareness of viewers.

## SUMMARY

Visuals are prepared for a purpose. When that purpose is related to behavior change, the visual can be classified by a position at a point along a continuum. The continuum begins at its lowermost end with visuals, which have only the purpose of attracting attention. At the opposite end of the continuum, which may be considered to be the more sophisticatedly complex end, visuals should be found which have the purpose of near-total to total instruction. The continuum looks like this:

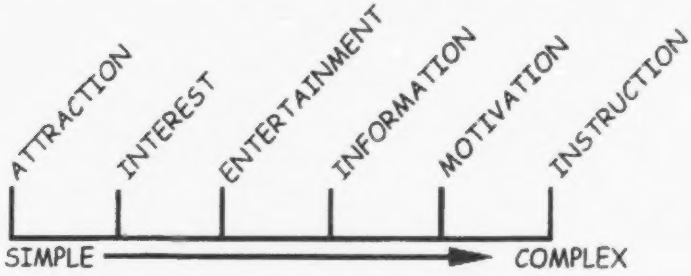


Figure 4.12. Simple–Complex continuum.

At the simplest end of the continuum, visuals are intended only to attract attention. Other than those capture that the immediate attention of the viewer, this kind of visual is composed of no other cues, symbols, verbals, or pictorial counterparts. When such a visual is successful in capturing attention, its hold on attention, otherwise unsupported, is temporary. About twelve seconds, or less, is all of the time that can be depended on without other visual devices.

At the next more complex level of the continuum can be found the visual condition, which generates interest. At this level something is added to the attractive element which enables it to hold attention somewhat longer than unsupported attraction. As the attention of the viewer is held, by perception, by a desire to scan, by focus on an attractive detail, or whatever else, the viewer can be said to be interested.

The next more complex visual format is the continuum's level entertainment. At the level of entertainment, it can be assumed that the viewer has had his cognizance pass through and be influenced by all of the preceding levels. His attention has been attracted, it has been held by the interest generated by what he perceives, and, at this level, what he perceives entertains him. At the level of entertainment, the visual holds the attention of the viewer for an additional period of time. The condition of entertainment can be identified by an overt, or even covert, reaction to satisfaction or pleasure.

At the next more complex level, the viewer experiences the gain of information. Again, at this level, the attention of the viewer has been attracted, it has been held by interest, it has been additionally held, perhaps even reinforced, by satisfaction or pleasure, called entertainment, and now, the viewer consciously perceives information. The perception of information may include the conscious addition of an item of data to the repertoire of the viewer or the recognition of an indicator behavior as representing an act of appreciation, an establishment of values, the significance of a credo, or the perception of the details of a psychomotor skill.

The next higher level on the continuum to which a viewer of a visual might progress is the level of motivation. Motivation is the condition of the visual which provides a rationale which the viewer can accept. Thus far, in what has attracted the viewer, gained his interest, provided him with satisfaction or pleasure, and made him recognize that he has gained information he now finds a desire to continue perception. The visual has established in the viewer the desire to synthesize or apply the information that he has gained.

At the highest level of the continuum, the visual has been designed to include all of the characteristics which would make it instructional. The characteristics include: attention to and treatment of all of the visibility standards:

1. Detail height,
2. Line thickness,
3. Grid patterns,
4. Optical spacing,
5. Visual field,
6. Rule of thirds.

The aspects of the continuum include the following:

1. Eye-movement devices.
2. Emphasis designs.
3. Isolation techniques.
4. Coherence techniques.
5. Re-cycling techniques.

The mnemonic device "Successful Design Produces Better Visuals Helpfully" features the following characteristics:

1. Simplicity.
2. Dominance.
3. Pattern.
4. Balance.
5. Variation.
6. Harmony.

Other techniques include the following:

1. The effective use of "white" space.
2. Attraction techniques.
3. Line uses.
4. Visual elements.
5. Cue reduction.
6. Syntax.
7. Backgrounding.

The level of instruction also makes use of all the other aspects of the continuum to serve its primary purpose, to change behavior from whatever it is to whatever it is supposed to become, and to develop behavior progressively and refine it.

A visual that has significant details in conditions that deny the viewer the ability to resolve them and to relate one significant detail together with its subordinate elements to other significant details, is inadequate. Whatever an inadequate visual costs, it is too expensive.

Depending on the assumptions of whoever employs the visual to instruct, when the visual is inadequate, it may also be wasteful of time, energy, and the opportunities to learn. A more suitable visual, used within equivalent frameworks of instruction and conformed to the appropriate standards and techniques, is cost-effective and worth whatever it costs. A visual that employs verbals, symbols, and/or pictorial counterparts that require viewers to analyze their meanings by deduction or induction obstructs learning. Unless the purpose of the visual is to educe analysis, deduction, or induction of meaning, that is, to decode the message by means equivalent to cryptographic techniques, it is unnecessarily resistant to generating a target behavior change. Meanings for verbals, symbols, pictorial counterparts, and the arrangements of any of them which the designer believes to have a specific meaning, are actually in the beholder. To assure a consistency of interpretation, the designer of a visual needs to know the kinds of meanings that are held by the target audience, and to use the visual components that are dependable. The alternatives are to teach the target audience the meanings that are intended by specific visual components or to gamble that the audience will, somehow, interpret the meanings correctly. The latter gamble is an extreme long shot that seldom pays off.

One of the elements of a visual that can attract and hold attention is motion. Motion can be provided by means of small, inexpensive, battery-powered motors. There are motors that oscillate, others which rotate, and two- and four-place motors that revolve visuals, or parts of them in stages. Walt Disney's animators have discovered that increasing degrees of realism, and, at least, increasing interest are obtained with the use of countermotions, either within or between visual components.

## DESIGNING MEDIA FOR INSTRUCTION

Storyboarding is a technique that provides system in any type production. The technique requires only cards and a large wall or table area.

Cards are used primarily because they are durable and self-supporting. They are relatively inexpensive and easy to obtain. The 5" × 7" card is a convenient size. The card should be divided as shown in Figure 4.13.

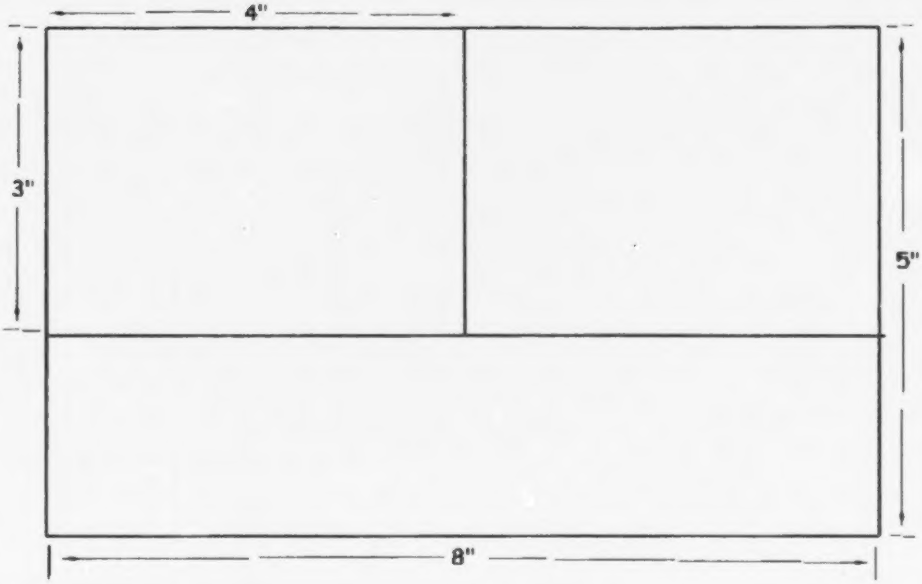


Figure 4.13. Storyboard card.

The division can be hand drawn with a straight-edge and a felt tip pen, or it can be printed. Hand drawing can be very time consuming, so it may be useful to have a supply of these cards printed professionally. Some storyboard programs are available on the World Wide Web.

The three sections of the card are used to develop: (1) narrative, (2) images, and (3) status and objectives. The upper left section (Figure 4.14)

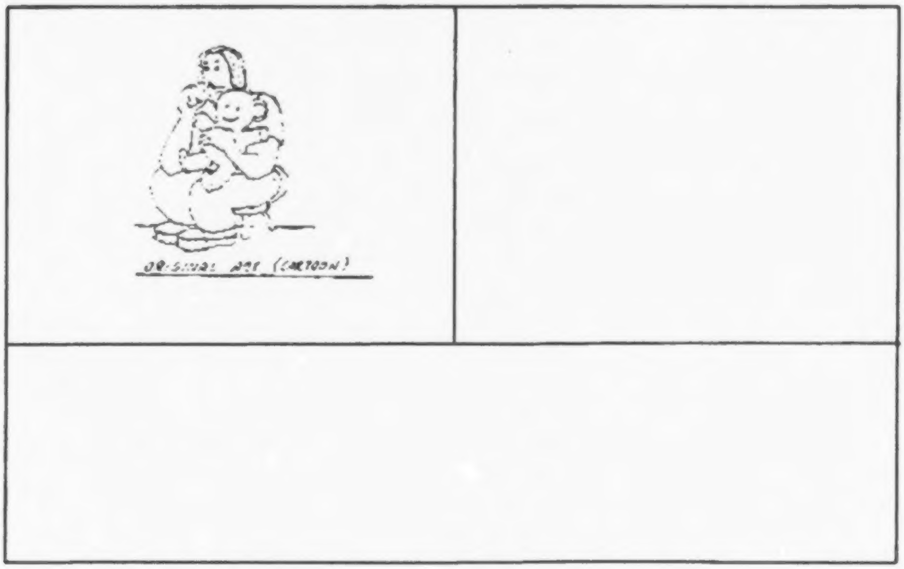
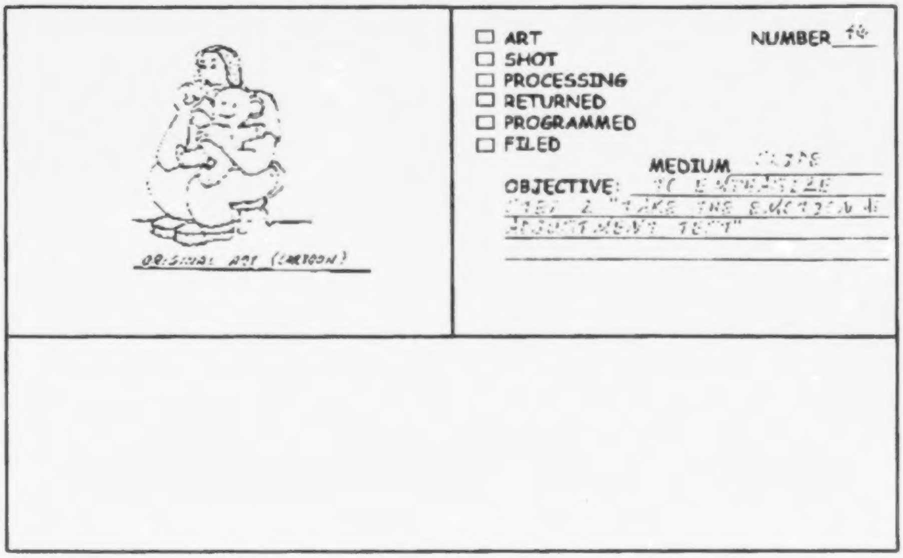


Figure 4.14. Storyboard card.

BEST COPY AVAILABLE



ORIGINAL ART (CARTOON)

☐ ART
☐ SHOT
☐ PROCESSING
☐ RETURNED
☐ PROGRAMMED
☐ FILED

NUMBER 14

MEDIUM SLIDE

OBJECTIVE: TO EMPHASIZE STEP 2 "TAKE THE EMOTIONAL ADJUSTMENT TEST"

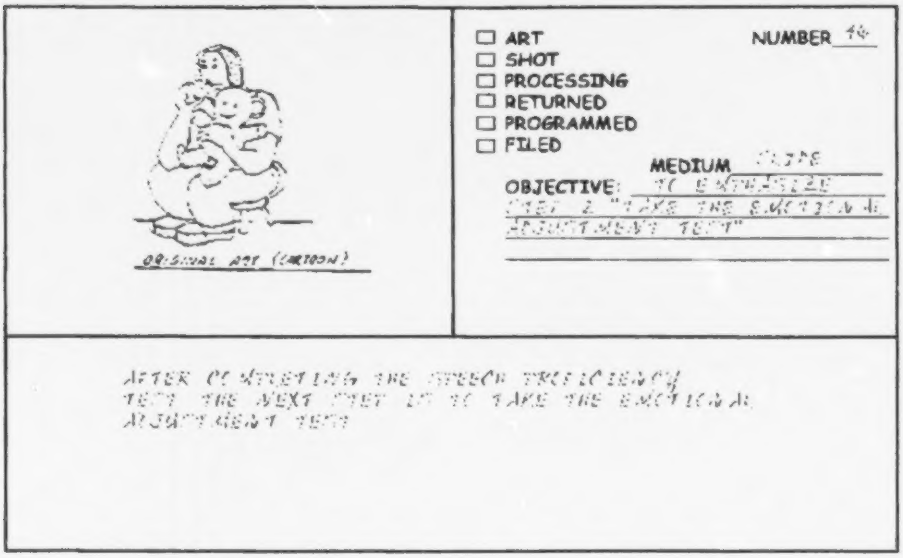
Figure 4.15. Storyboard card.

can be used to sketch illustrations or to describe them verbally or to place a bibliographical reference if the image is to be scanned from a another source. The source of the image, if scanned, can be stated for reference. The illustration should be in direct support of the narrative/text.

The upper right section (Figure 4.15) of the card contains the status information and objective for that image. The status information that provides the control system includes artwork, photography status, processing status (if emulsion photography), post-production status (if digital photography), whether the completed visual is put into the program or filed, where it is filed (with emulsion photography, the physical location; with digital photography, the electronic location—hard drive, disk, CD, server, etc.), and file status. Other information contained in this section includes the number of the scene or its position in the program, the medium to be used, and a statement of the objective (reason) for the image.

The narrative, or text, is written in large letters on the bottom (Figure 4.16) of the card. All of the audio (if streamed) or text, pertaining to the visual should be in this section. The narrative/text for one image should not exceed 45 words or 15 seconds. If the space is not large enough, go to the next card, continue the narrative on it, and leave the upper sections blank except for the word "continuation" in the upper left section.

BEST COPY AVAILABLE



ORIGINAL ART (CARTOON)

☐ ART
☐ SHOT
☐ PROCESSING
☐ RETURNED
☐ PROGRAMMED
☐ FILED

NUMBER 16

MEDIUM SLIDE

OBJECTIVE: TO EMPHASIZE STEP 2 "TAKE THE EMOTIONAL ADJUSTMENT TEST"

AFTER COMPLETING THE SPEECH PROFICIENCY TEST THE NEXT STEP IS TO TAKE THE EMOTIONAL ADJUSTMENT TEST

Figure 4.16. Storyboard card.

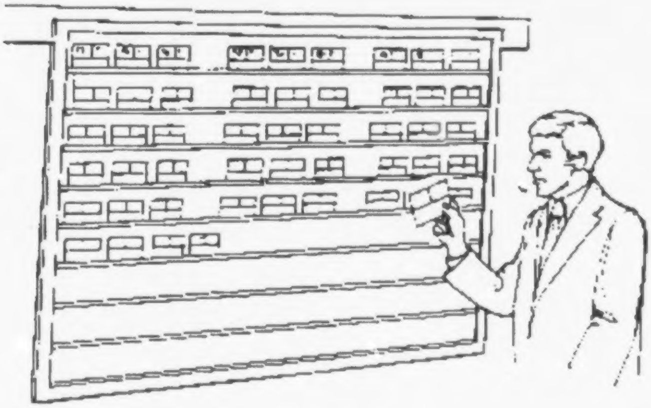


Figure 4.17. Storyboard.

You will have at least one card for every image in the program. Every card will have information about the visual, a reason (objective) for that visual (if you don't have a reason, then you don't need the slide—omit it), a number (consecutive), and audio instructions. Once the production has been completely planned you begin the production phase. You will find it convenient to arrange all shots in one location into one group. After the artwork has been completed, the pictures taken, and the film/raw data is being processed, the other media, such as the web site, can be produced and programmed. When the images are processed, all you have to do is match the slide to the appropriate card and then place the slide in the corresponding location in the program.

BEST COPY AVAILABLE

The storyboard can be a cork or ply board on which clear plastic strips have been stapled (Figure 4.17). The better strips have a beaded edge that implements the insertion, holding, and withdrawal of the cards. A tentative order within the cards can be arranged by placing them in the storyboard from left to right and from top to bottom. Skip every third or fourth space on the board to allow for easier editing. Cards can be added, deleted, or rearranged easily using this technique. Selecting cards and placing them on the storyboard has several purposes:

1. They give the designer an integrated overview of the organization.
2. They allow for easy sequencing and rearranging.
3. They allow for easy deletion and replacement.
4. They allow for easy revision and refinement.
5. They allow for convenient abridgment between cards to provide or enhance continuity.

## CHAPTER 5

# THE WORLD WIDE WEB

*Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned.*

—Marshall McLuhan, Understanding Media (1964).

Marshall McLuhan achieved penetrating insights into the electronic age and became its most renowned interpreter. He is named among the top one hundred of the World's most influential persons of the past millennium on various lists. His knowledge and writing as a communications theorist explains how society and human psychology were changed when a preliterate oral culture was supplanted with the invention of the phonetic alphabet and a manuscript culture gave way to the Gutenberg era of movable type, the printing press, and mass-produced books. *Understanding Media: The Extensions of Man* explores the electronic age and its effects on individuals and society. He coined the terms "global village," "hot media," "cool media," and "the medium is the message."

McLuhan made the concept of a global village, interconnected by an electronic nervous system, part of our popular culture well before it actually happened.

Marshall McLuhan was the first person to popularize the concept of a global village, and to predict its social effects. His insights fundamentally changed how everyone has thought about media, technology, and communications ever since. He chose the phrase "global village" to highlight his insight that an electronic nervous system was rapidly integrating the

INSTRUCTIONAL DESIGN: SYSTEM STRATEGIES, pages 165–186

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planet, so that events in one part of the world could be experienced in real-time from other parts, which is what human experience was like when we lived in small villages.

McLuhan's second best known insight is summarized in the expression "the medium is the message," which means that the qualities of a medium have as much effect as the information. For example, reading a description of a scene has a very different effect on someone than hearing about it, or seeing a picture of it, or watching a black and white motion picture or watching a color video. McLuhan was particularly fascinated by the medium of television, calling it a "cool" medium, noting its soporific effect on viewers. He took great satisfaction years later when medical studies showed that TV does in fact cause people to settle into passive brain wave patterns. One wonders what he would make of the World Wide Web?

McLuhan made a study of the extrapolation of current trends in technology, and specialized in the effects on human communications. He generally felt that the developments he described would be positive, but particularly worried about the potential for very sophisticated, manipulative advertising. He mentored Wilson Bryan Key who subsequently wrote *The Age of Manipulation*. This book echoed McLuhan's concern about manipulative advertising. McLuhan also was an advisor on the doctoral committee of one of the authors (Ledford) of this book.

McLuhan made the idea of an integrated global nervous system a part of our popular culture, so that when the net finally arrived on a worldwide scale, it seemed no less amazing, but somehow in the natural order of things.

## The Internet

The interface most commonly used today is called the World Wide Web. The World Wide Web is an outgrowth of, and a part of, a larger system called the Internet.

The Internet has revolutionized the computer and communications world like nothing before. The invention of the telegraph, telephone, radio, and computer set the stage for this unprecedented integration of capabilities. The Internet is at once a world wide broadcasting capability, a mechanism for information dissemination, and a medium for collaboration and interaction between individuals and their computers without regard for geographic location.

The Internet represents one of the most successful examples of the benefits of sustained investment and commitment to research and development of information infrastructure. Beginning with the early research in packet switching, the government, industry and academia have been partners in evolving and deploying this exciting new technology.

This is intended to be a brief, necessarily cursory and incomplete history. Much material currently exists about the Internet, covering history, technology, and usage. A trip to almost any bookstore will find shelves of material written about the Internet.

Primarily because of the needs inherent in the cold war, it became obvious to the Military and Department of Defense that the ability to wage modern warfare had to be decentralized. One well-placed missile on "headquarters" could neutralize us. Not only would the "button pushing" ability be affected, but also mounds of data developed by the military, contractors, researchers, and universities could be wiped out. A system was developed that was decentralized. In fact, one of the characteristics of a system is that it is decentralized. A system is a collection of sub-systems that work together to achieve a goal. The system is decentralized in that no one subsystem is more important than any other subsystem. When a subsystem is destroyed, or its efficiency is curtailed, the other subsystems compensate. This new system had no "heart" or any one location that was critical. There were several locations around the country, and eventually around the world, which were connected by telephone lines and shared data in a mosaic fashion. If any site were disabled, the other sites could compensate. All would have the data.

At first the data that were shared were in a binary format—text and numbers. Compared with current displays, it was not at all "sexy." The various points within this mosaic, or network, were called servers for obvious reasons. Most of these servers were university based and were associated with supercomputers. Research universities had the grants from the military and department of defense to do research and they developed a protocol to share information. The method used to transfer this binary data was called ftp, an acronym for file transfer protocol. It is still in use today. It was generally cumbersome, requiring special passwords and knowledge to access. Later in the development of this behemoth called the Internet the servers (mostly university libraries) started making available all kinds of data of interest to the "educated" lay person: their card catalogs, data bases like ERIC, general encyclopedic information, weather, atlases, and so on. They started offering e-mail. Various universities started offering protocols: some of the more famous include the University of Minnesota which offered a protocol called gopher and to "surf" the Internet was called burrowing and sites were called gopher holes. Wisconsin offered a protocol based on bears. Auburn University used duc (division of university computing) with sub-protocols called mallard and woodduc among others. One protocol was named after a comic strip—Archie. It had sub-protocols named Veronica, Betty, and yes, Jughead.

The global village described and predicted by McLuhan, was gathering momentum. In 1993 the University of Illinois developed a graphical interface (remember, up to now everything had been primarily text based). The World Wide Web was born! This graphical interface was called Mosaic and by today's standards was primitive. In 1992, a research institute at the University of Illinois, the NCSA (National Center for Supercomputer Applications) began to refine Tim Berner-Lee's work, which he had done from 1980 at CERN, in Switzerland.

CERN, originally called the Conseil Européen pour la Recherche Nucleaire, and now the European Particle Physics Laboratory, consists of many facilities located in a beautiful area in the Jura mountains on the border between France and Switzerland. It was because CERN was so large and complex, with thousands of researchers and hundreds of systems, that Berners-Lee developed his first hypertext system to keep track of who worked on which project, what software was associated with which program, and which software ran on which computers. Like the development of packet switching, hypertext and hyperlinks are ideas that seem to have wanted to be discovered.

## Hypertext and Hypermedia

At its lowest level, written text on a microcomputer is linear and essentially non-interactive—even more so than text in a book. With text in a book you can use page numbers, chapters, and even a "logical" guess to move from one section to another with more or less speed accuracy. You are essentially limited to the information contained with textbooks, and unless it has an extensive index, and sometimes even with one, you are not very efficient in finding other information in a non-linear fashion.

Some computer programs have menu's to make navigating the entire program a little easier. These programs often are limited to the information contained in the file. Subsequent developments and standards and this limitation makes them primitive and generally obsolete.

Starting in 1968, several working hypertext systems were developed over the years as both research efforts and commercial products. A few of the leading historical hypertext systems are ZOG, KMS, FRESS, NoteCard, InterMedia, Guide, and HyperCard. HyperCard was developed in 1987 for the Macintosh computer, making a hypertext system widely available for the first time. HyperCard enabled browsing, authoring, and included the HyperTalk programming language to enable a highly customizable graphical environment, and was widely used and influential. The concept was simple: a file would be composed of individual cards which would be arranged in a somewhat linear fashion with options on each file card to go to next card in the sequence or to another card in a nonlinear (non-sequential) fashion. The feature that made this program revolutionary was that certain words or phrases in the written text could be linked to other locations within that stack instantaneously in a "permanent" fashion; that is, the link is not intended simply to be further explanation or elaboration and then terminate by returning the user to the original page (from which the initial link was made) but to provide closure on itself, or to link elsewhere (to include back to the original).

The user can go forward to the next card by pointing and clicking on the right-pointing arrow, go to the previous card by choosing the left-pointing arrow, or, by clicking on either word Africa or Asia make a link to a section on those topics.

Hypermedia shortly followed hypertext. The two are the same except hypermedia adds non-print information to the options. For example, on the card in the HyperCard stack is an icon denoting a speaker. If the user selects that icon, he/she can hear a recorded sound. In the example the sound could be the trumpet of an elephant. The camera icon can denote a film clip (or video) of an elephant.

Hypertext and hypermedia were revolutionary. However, when considered by today's usage they were naïve. The user is limited by the files, or content, on a single floppy disk or hard drive, or CD, or even network. With the development of the World Wide Web, hypertext and hypermedia have been rendered to become unlimited in their applications. For example, in just a few choices a learner can follow a route that takes him from elephants to fish in a circuitous yet coherent route. For example, in a HyperCard stack the user is limited by the few number of cards and links contained in the stack. On the World Wide Web, literally millions of links are possible. One can load a Website on the topic of elephants, which contains information that two species of elephants are African elephants and Asian elephants. Selecting Asian elephants, there is a link to India; from India to Ghandi and peaceful resistance, to Dr. Martin Luther King, Jr., to Alabama, to Auburn University, to the program of Fisheries at Auburn. This route is completed in a short period of time and without leaving the comfort of one's desk.

## Browsers

A browser is a piece of software which acts as an interface between the user and the Internet, specifically the World Wide Web. The browser contacts a Web server, sends a request for information, receives the information and displays it on the user's computer screen. The browser works by using a protocol called HyperText Transport Protocol (HTTP) to request a specially encoded text document from a Web. This text document contains special markup written in HyperText Markup Language (HTML). This markup is interpreted by the browser and displayed on the screen of the computer. HTML may include such things as references to other Web documents using hyperlinks, suggestions for text color and position, and other content such as images and audio and visual ("multimedia") content.

Modern browsers are graphical displays that make the Internet easier to use and more intuitive. The WWW incorporates hypertext, photographs, sound, video, etc. that can be fully experienced through a graphical browser.

Browsers sometimes need "plug in applications" which are actually software programs that are needed to display special types of images, sounds or animation. These helper applications are automatically invoked by the browser when a user selects a link to a resource that requires them. A graphical browser allows the user to view images on their computer, "point-and-click" with a mouse to select hypertext links, and uses drop-down menus and toolbar buttons to navigate and access resources on the Internet.

A version of Mosaic for the Macintosh was developed by Aleks Totic and released a few months later, making Mosaic the first browser with cross-platform support.

One of the NCSA's missions is to aid scientific research by producing noncommercial software to develop Mosaic as a free, publicly available browser.

Mosaic provided support for graphics, sound, and video clips. An early version introduced form support, enabling many powerful new uses and applications. Innovations with use of bookmarks and history files were added. Mosaic quickly became the most popular Web browser, helping accelerate the growth in Web usage even more.

The NCSA stopped developing Mosaic in January 1997, since Netscape and Microsoft began to bring large development teams to bear on development of their own browsers.

In the early 1900s, the University of Kansas wrote a hypertext browser independently of the Web, called Lynx, and was used to distribute campus information. An Internet interface was added to the program, and it was released as the Web browser Lynx 2.0 in March 1993. Lynx quickly became the preferred Web browser terminals without graphics, and it remains in use today.

In October 1994, Netscape released the first beta version of their browser, Mozilla, over the net. On December 15, the final version was released, Mozilla 1.0, making it the first commercial Web browser.

In 1995 Microsoft released their Windows 95 operating system which included a Web browser called Internet Explorer. By the fall of 1996, Explorer had a third of market share, and passed Netscape to become the leading Web browser in 1999.

Today, Microsoft Internet Explorer and Netscape Communicator are the leading browsers, but there are other options as well.

There are a core set of key programs that can extend the capabilities of your browser. Several companion programs for Internet Explorer can be set on the window "Tools -> Internet Options -> Programs". Internet Explorer generally downloads additional plugins automatically the first time it needs them, and will prompt you for permission if it runs an installer program.

You should try not to download too many plugins, especially when they provide overlapping capabilities. Check and delete any extra plugins that build up in your plugin folder if you later uninstall their programs.

The average plugin is between 500 KB and 1 MB in size. If you have the disk space, you should get the latest copy of the following key plugins which are widely used across the net: Acrobat, Mediaplayer, Quicktime, Realplayer, and Shockwave.

## Streaming

Effective use of audio and video in online courses requires streaming technologies. Streaming technologies allow you to send audio, video and other forms of multimedia across standard computer lines while at the same time being able to hear or see the file while it is downloading. In other words, you see or hear what is available the minute it arrives, without having to wait for the entire file to download before you start. Video and audio files can be converted to a streaming format and stored on a server at various bit rates. When a streaming technology is installed, media data is streamed from the system at the maximum bit rate that the server and end user can support.

Several streaming tools are currently available for online learning, including Microsoft's NetShow Theatre Server, Intel's Indeo, and Real Network's RealAudio. Quite a bit of information on all of these tools, and how to use them to create media streams are available at their respective web sites—most offer free limited evaluation periods:

### NetShow Theater server: http://www.microsoft.com/theater

Microsoft® NetShow™ Theater Server is a powerful, flexible streaming media solution for delivering broadcast-quality MPEG video. NetShow Theater Server extends the streaming media services of Windows NT Server NetShow Services to much higher bandwidths, allowing you to deliver full-motion, full-screen video with guaranteed performance across high-bandwidth networks.

### Intel Indeo: http://developer.intel.com/ial/indeo/video/samples.htm

Intel Indeo video files on a Web server can be created in such a way that lower resolution, lower frame rate video can be viewed almost immediately, allowing the user to quickly decide if they wish to continue viewing the video or download it to their hard drive. Given more download time, and/or a faster Web connection, a progressive download file will continuously improve in both quality and frame rate until all of the video data is downloaded from the Web server to the client PC.

### Real Network's RealAudio: http://www.real.com/company/pressroom/rnleadership/index.html#

RealNetworks pioneered streaming media in April 1995 with the release of RealAudio version 1.0 and has single-handedly secured the leadership position as the standard for delivery of multimedia. RealSystem G2 is a fully integrated encoder, server, splitter/cache and player system with a two-way intelligence to resolve network congestion, lost packet conditions and negotiate complex internet protocols. RealNetworks currently has over 60 million registered users of its RealPlayer, up from 21 million in 2000. According to MediaMetrix, RealPlayer's usage places it as the most used Internet application after browsers and commercial online services.

### http

The Hypertext Transfer Protocol (HTTP) is used when your browser connects to a Web server, requests a Web page from the server, and downloads the page. It is the common standard that enables any browser to connect to any server, anywhere in the World. The HTTP client sends a document identifier with or without search words, and the server responds with hypertext or plain text. The protocol runs over TCP, using one connection per document request. The browser acts as a pipeline, so that as the bytes arrive from the server they can be presented to the reader as soon as they arrive.

HTTP was designed by Tim Berners-Lee to support the special demands of Web communications, with an emphasis on efficiency, and a target page load time of under a tenth of a second. Modern networks can support this type of response provided the page is not too large and the server too far away.

Your browser can open more than one HTTP connection at once to download different parts of a Web page, downloading the text, graphics, and other objects on the page in different orders.

## html

HTML is the code used to design Web pages so that when a file is transferred by http from the server to the user's computer, the browser can display the information. The html code is designed to be as simple as possible. Each command consists of an opening tag in angle brackets, like <tag>, and a closing tag with an added slash, like </tag>. Some of the most common commands are listed below, together with the result displayed when the HTML is read by a Web browser:

| HTML | Web Page Result |
|---|---|
| The water is <b>very</b> blue. | The water is **very** blue. |
| The wind is <i>very</i> warm. | The wind is *very* warm. |

Every Web page is written in HTML, which is text based, so it's easily and quickly communicated across the Internet. On most browsers you can view the HTML for any Web page you visit, including this one, by selecting "View Source" from the browser toolbar, or from a popup menu appearing when you right-click on a particular frame. When you are finished viewing the Web page source you can close that window without affecting any of the pages you are viewing. A source code for a Web site is included in Appendix A.

HTML is relatively easy to learn. The learning curve is steep. Numerous books and Web sites are readily available so that even the most inexperienced can develop authoring skills in a relatively short period of time.

A "cheat sheet" of html tags is presented in Appendix B.

## Uniform Resource Locator (URL)

The Uniform Resource Locator is the logical address of a Web page. A Web page URL's main feature is its universality—the address is the same no matter where in the world it is used. The word URL can be pronounced either "U-R-L" or "earl." The URL of the current page is usually shown at the top of your Web browser, and should be something like "http://www.auburn.edu /." Like your home address, no two URL's are the same. Each one is unique.

URLs are case sensitive. When establishing a Website, it is recommended that you use only lower case font in the URL, and to avoid special characters (such as &, _, ^, etc). The URL for names that normally would be proper names and therefore capitalized should be lower case, and with no spaces between words. For example, the American Airlines URL is http://www.americanairlines.com

How does one find the address, or URL, of a given Website, or find the URL's pertaining to a specific topic? Three ways are commonly used: search engines, advertising/printed literature such as on matchbook covers and through intuitive usage. Each of these techniques will be discussed in greater detail.

## Search Engines

Search engines survey the Web and build databases. Web documents are automatically retrieved and indexed. When you enter a query at a search engine Website, your input is checked against the search engine's keyword indices. The best matches are then returned to you as hits and usually displayed as URLs and accompanied by a description of the site.

There are two primary methods of text searching—keyword and concept. Keyword searching is far more common. Determining the concept behind a particular Web page continues to be a challenge for search engine companies. Keyword searching is the typical form of text search on the Web. Unless the author of the Web document specifies the keywords for her document (this is possible by using meta tags in the html coding; for example a tag in the code might be <META NAME="keywords" CONTENT="real estate, florida, century 21, coral springs, ft. lauderdale, realtor, realtors">), it's up to the search engine to determine them. Essentially, this means that search engines pull out and index words that are believed to be significant. Words that are mentioned towards the top of a document and words that are repeated several times throughout the document are more likely to be deemed important.

Most search engines now index every word on every page. Others index only part of the document, such as the title, headings, subheadings, hyperlinks to other sites, and the first 20 lines of text.

Full-text indexing system generally pick up every word in the text except commonly occurring stop words such as "a," "an," "the," "is," "and," "or," and "www." Some search engines claim to index all words, even the articles, "a," "an," and "the." Some of the search engines discriminate upper case from lower case; others store all words without reference to capitalization.

Unlike keyword search systems, concept-based search systems try to determine what you mean, not just what you say. In the best circumstances,

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a concept-based search returns hits on documents that are "about" the subject/theme you are exploring, even if the words in the document do not precisely match the words you enter into the query.

A refinement is known as clustering—which essentially means that words are examined in relation to other words found nearby.

Most sites offer two different types of searches—"basic" and "advanced." In a "basic" search, you just enter a keyword without sifting through any pull-down menus of additional options. Depending on the engine, though, "basic" searches can be quite complex.

Advanced search refining options differ from one search engine to another, but some of the possibilities include the ability to search on more than one word, to give more weight to one search term than you give to another, and to exclude words that might be likely to muddy the results.

Many, but not all search engines allow you to use so-called Boolean operators to refine your search. These are the logical terms AND, OR, NOT, and the so-called proximal locators, NEAR and FOLLOWED BY.

## Intuitive Usage

URL's contain specific components. Consider the following *URL: http://www.auburn.edu*. Common to all URLs is the *http://www.* (Although all browsers do not require this part of the URL to make a connection to the desired link.) This part of the URL translates as hypertext transfer protocol (http) and World Wide Web (www) separated by ://. The next part of the URL, in this example, auburn is the domain name. Each URL will have a domain name. The last part (the suffix, or extension) of the URL, in this example edu, is the domain type. Every domain name has a suffix that indicates which top-level domain (TLD) it belongs to. There are only a limited number of such domains. For example:

com—Commercial usage
gov—Government agencies
edu—Educational institutions
org—Organizations (nonprofit)
mil—Military
net—Network organizations

There are other domain types which currently exist. New domains are being added on a regular basis.

An extension, or Top Level Domain (TLD), is the highest-level category of Internet names. The domain name space is divided into several TLDs. The extensions .com, .net and .org are called "generic" domains because they are not affiliated with any country. These types of generic domains are unrestricted—this means anyone from anywhere can register as many .com, .net, or .org domain names as they like. Recently introduced TLD's like .info and .biz are examples of global Top Level Domains (gTLDs). The extensions .tv (from Tuvalu) and .ws (from Western Samoa) are examples of country code Top Level Domains (ccTLDs). The ccTLDs are operated by separate registry authorities in 192 countries. Unrestricted country-specific domain names allow anyone from anywhere to register a domain name just like .com, .net and .org. Some ccTLDs have been opened by their respective countries to anyone looking for a creative alternative to a gTLD. For example, .tv is now available for anyone who might want their Web extension to mean "television." And .ws is open to anyone who might want their Web extension to mean "Web site." Some ccTLDs have restrictions on the name and amount you can register—often a local presence is required to register a name.

Domain names that reflect the name of a business, concerns of an organization, a function of a government agency, or a university are highly sought and are considered valuable property. For example, chevrolet.com is owned by the Chevrolet division of General Motors, and ford.com is owned by Ford Motor Company. Universities value domain names that reflect their name, for example Auburn University is auburn.edu, Harvard University is harvard.edu, and Arizona State University is asu.ed. These "intuitive" names make it easier for one to locate a Website without having to use a search engine or consult other sources.

## Published Addresses

Many, if not most, companies, educational institutions, government agencies, the military, and individuals now have Web sites. Their business cards, product packaging, letterheads, advertising in magazines, in newspapers, on billboards, and on radio and television prominently display their Web site addresses. In the infancy of the World Wide Web, most prognosticators felt that the future of the Web was in direct sales of products and services. While direct sales and direct services have been lucrative for some companies, agencies, universities, among others, the greater benefit appears to be in their Web presence. Most Web users have become accustomed to finding out about goods and services, and general information, and "free services" on the Web. For example, many banks now offer online banking services, either free or for a nominal fee, as an enticement to people to bank with them.

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## IP Addresses

Because the Internet is based on IP addresses, not domain names every Web server requires a Domain Name System (DNS) server to translate domain names into IP addresses.

When your Web browser or e-mail application requests a Web page or e-mail from another computer on the Internet, it automatically gives that computer the address where it should send the information. This is called your computer's "IP address." (IP stands for "Internet protocol.") For most users accessing the Internet from a dial-up Internet service provider (ISP), the IP address will be different every time you log on. Your IP address can be either static, meaning it never changes, or dynamic, meaning each time you dial-in or login you are assigned a new address for that session. Check with your Internet service provider or network administrator to find out if your computer uses static or dynamic IP addressing.

## Internet Service Providers (ISP)

Before you can get connected to the Internet you need to have certain things in place. These include a "modern" PC, preferably with Windows 95 or 98, or System 8.5 (or above) on a Mac, a modem (either internal or peripheral), a working telephone line, and an Internet browser. You can get access to the Internet by either of the following ways (each will be discussed in greater detail): dial-up connection, a DSL (digital subscriber line), cable modem, ISDN (Integrated Services Digital Network), T1 or T3 line, or a satellite hookup.

Regardless of your hookup, ideally your ISP should be at least four years old. Regardless of whether it is local, regional, or national the ISP should have favorable reviews from users in your area (check out *www.isp.com* to read subscribers ISP reviews). The ISP you are considering should have a good, informative Website, listing all local dial-up numbers and terms of service.

A good ISP will provide a free trial period, low or no set-up fee, understandable subscription plan options (avoid pre-pay plans). A good ISP will offer a PPP account. Most good ISPs offer 5–10 MB of Web space and 300Mbmonth of Web "bandwith" (how much can be downloaded from your site) is standard.

Verify with your telephone subscription service that your connection to the ISP is a local call. For 800 dial-up connections, many ISPs have surcharges of 10 cents a minute and up. Test the dial-up during peak periods to see if you can get through consistently. If you are using a 56K modem verify the speed at which you are actually connecting. Be sure that you know how "unlimited" and "unmetered" access are defined. Find out if there is tech support, if it is free, and if it is a toll call.

## DSL

DSL (Digital Subscriber Line) is a technology for bringing broadband width information to homes, small businesses, and schools over ordinary copper telephone lines. Assuming your home, small business, or school is close enough to a telephone company central office that offers DSL service, you may be able to receive data at rates up to 6.1 megabits (millions of bits) per second (of a theoretical 8.448 megabits per second), enabling continuous transmission of motion video, audio, and even 3-D effects. More typically, individual connections will provide from 1.544 Mbps to 512 Kbps downstream and about 128 Kbps upstream. A DSL line can carry both data and voice signals and the data part of the line is continuously connected. DSL installations began in 1998 and will continue at a greatly increased pace through the next decade in a number of communities in the United States and elsewhere.

## ISDN

ISDN, which stands for Integrated Services Digital Network, is a system of digital phone connections which has been available since 1992. This system allows data to be transmitted simultaneously across the world using end-to-end digital connectivity. Most copper-wire Internet connections transmit at or well below 56K per second. An ISDN transmits between 64K and 128K which early in its history was a notable improvement over the regular 56K modem The ISDN requires special equipment and the service is usually expensive. Most recently, ISDN service has largely been displaced by broadband Internet service, such as DSL and Cable Modem service. These services are faster, less expensive, and easier to set up and maintain than ISDN. Still, ISDN has its place, as backup to dedicated lines, and in locations where broadband service is not yet available.

## Cable Modem

A cable modem is a device that enables you to hook up your PC to a local cable TV line and receive data at about 1.5 Mbps. This data rate far exceeds that of the prevalent 28.8 and 56 Kbps telephone modems and the up to 128 Kbps of Integrated Services Digital Network (ISDN) and is about the data rate available to subscribers of Digital Subscriber Line (DSL) telephone service. A cable modem can be added to or integrated with a set-top box that provides your TV set with channels for Internet access. In most cases, cable modems are furnished as part of the cable access service and are not purchased directly and installed by the subscriber.

A cable modem has two connections: one to the cable wall outlet and the other to a PC or to a set-top box for a TV set. Although a cable modem does modulation between analog and digital signals, it is a much more complex device than a telephone modem. It can be an external device or it can be integrated within a computer or set-top box. Typically, the cable modem attaches to a standard 10BASE-T Ethernet card in the computer.

All of the cable modems attached to a cable TV company coaxial cable line communicate with a Cable Modem Termination System (CMTS) at the local cable TV company office. All cable modems can receive from and send signals only to the CMTS, but not to other cable modems on the line. Some services have the upstream signals returned by telephone rather than cable, in which case the cable modem is known as a telco-return cable modem.

The actual bandwidth for Internet service over a cable TV line is up to 27 Mbps on the download path to the subscriber with about 2.5 Mbps of bandwidth for interactive responses in the other direction. However, since the local provider may not be connected to the Internet on a line faster than a T-carrier system at 1.5 Mpbs, a more likely data rate will be close to 1.5 Mpbs.

In addition to the faster data rate, an advantage of cable over telephone Internet access is that it is a continuous connection.

## T1/T3 Line

A T1/T3 line is a telephone line connection for digital transmission that can handle 24 voice or data channels at 64 kilobits per second, over two twisted pair wires. T1 lines are used for heavy telephone traffic, or for computer networks linked directly to the Internet. T1 lines are normally used by small and medium-sized companies and educational institutions with heavy network traffic. They can send and receive very large text files, graphics, sounds, and databases very quickly. Sometimes referred to as a leased line, a T1 is generally too large and expensive for individual home use.

A T1 connection to the Internet that is intended to be shared on a network or through modems is comparable to the main water line for a city. Like the main waterway for a city is the backbone of the city's water distribution system, a T1 can serve as a backbone for a network's Internet bandwidth. The computers on the network or customers connecting with the modems are then respectively the houses in the city with tap water.

Therefore, there is enough Internet bandwidth (water) traveling through the T1 line (main waterway) to support all of the computer uses (house taps) in the network (city). It is important to note that the more computer users you put on the network, the bigger your backbone will have to be.

A T3 is a bundle of twenty-eight T1s and providing 44.736Mb/s of bandwidth through-put or 672 simultaneous phone calls.

The number one difference between a T1 Internet connection and ISDN or DSL is speed. Download speaking, a T1 is twelve times the highest speeds possible on ISDN and more than twice as fast as the entry level DSL service. It is also important to note that a T1 connection is full duplex. This means that your upload speed is not affected by your download transmissions. Therefore, you have the ability to both send and receive information at high speeds at the same time.

The next most important difference that really sets a T1 connection apart from DSL and ISDN is reliability. Since a T1 connection is dedicated to the customer's equipment, provider's equipment, and the telephone company's digital wires there is the least chance of the connection being interrupted. Furthermore, if the service is ever interrupted, response time for repair is generally much quicker on a T1 level service.

## Satellite

Although satellite Internet access is more expensive than traditional dialup Internet connections, cable modem and DSL services, the service is most attractive to those who do not have access to any other broadband connectivity. This includes many rural areas.

Satellite service can work in places where other ISPs aren't available because it doesn't require a direct connection to the public phone system or cable network. It works a lot like satellite TV, where customers prop a dish outside their home. Users only need an unobstructed line-of-sight in the direction of the satellite to access the Internet at speeds that are many times faster than standard dialup connections. Often, service providers bundle satellite TV services with the Internet service, letting customers combine equipment and installation costs for two services at once. Internet access is often one way (DL) and varies in speed, quality and price.

Generally most Internet users only need high-speeds when they download, such as when viewing a web page with several large graphics, or requesting large files. In this case, the outbound requests (usually quite small—1/10 to 1/100 the size of returning information) are sent over traditional lines, through an Internet Service Provider (ISP), while incoming data is beamed down from a satellite.

## Servers and Web Hosting

Each Web site is managed by a Web server. A Web server for a Web site handles all of the network communications with individual user browsers. The server accepts HTTP requests for Web pages, and sends the pages to the browser over the net.

Any Windows, Macintosh, or Unix computer is capable of running a Web server when it is connected to the net. However, it isn't practical over a dial-up connection since they are slow, not always connected, and change their IP Address every time you log on. A dedicated connection in an office, or a high speed home connection like DSL, provides the always-on attribute needed to run a reliable Web server.

A Web server may be dedicated for one domain, or maintain Web sites for several domains.

Web hosting, and Webhosting is the service of housing, serving, and maintaining files for one or more Web sites. More important than the computer space that is provided for Web site files is the fast connection to the Internet. Most hosting services offer connections on T-carrier system lines. Typically, an individual business hosting its own site would require a similar connection and it would be expensive. Using a hosting service lets many companies share the cost of a fast Internet connection for serving files.

## Cookies

A Web site stores a file on your computer to keep track of information about your activity on that site. This file is called a Cookie. A simple example cookie for an imaginary Web site is shown below:

```
# Example Cookie
# Recorded 2002–10–12
username=John
password=treeline8
frames=yes
```

Some of the reasons Web sites use cookies are described below.

Customization. Some sites use cookies to record your surfing patterns, and then optimize the information the site subsequently presents. For example, a search site may present you with advertising that reflects your interests based on the keywords you search for.

Distribution. One of the key reasons Web sites use cookies is to distribute the information storage. A cookie takes up a small amount of space on an individual stored back on a Web site's server.

Security. If a cookie was stored on a Web site, then it can be accessed by anyone with access to that Web site. However, when the cookie is stored on your computer, then it can't be accessed by hackers that break into the Web site.

Privacy. If a cookie was stored on a Web site, then you would have to identify yourself somehow so the site would know which cookie to give you. But when the cookie is stored on your computer, then the Web site simply uses whatever cookie it finds without requiring disclosure of your identity.

## Java & JavaScript/Applets

Web pages consist of more than text and graphics—they also often contain a range of programs that scroll text, display graphics, calculate results, and perform other actions. These programs are sometimes called "applets" as a diminutive of "applications." These programs are written in compact, text-based computer languages, so they take up little bandwidth and are downloaded very quickly, making them ideal for adding sophisticated custom functionality to a Web page that may be accessed over low bandwidth connections.

JavaScript programs are usually embedded in the page when it is downloaded. You can view the source code by selecting "View / Source" from your browser menu. Java programs may be downloaded with a Web page, or downloaded quickly when the user performs an action that specifically requires it.

Applets run on a software engine in your Web browser or on your computer called a "virtual machine." Most Web browsers include a virtual machine for JavaScript, and most operating systems include a virtual machine for Java.

Speed of download is a concern for World Wide Web users. For converted non-users and for beginning users the initial use can be frustrating if certain criteria are not taken into account. To many people a computer is a computer is a computer. However, all computers and World Wide Web usage are not created equally. Three groups of factors affect how satisfactory your experience will be.

Your Equipment. The type of processor (CPU) in your computer, its speed (measured in megahertz), the size of its random access memory (RAM), your plug-ins, the size and resolution of your screen, video memory, and the type/speed of your modem act in concert with each other and with the type of connection you have as well as the ISP you are using to affect the quality of Web usage.

Your Connection. Ideally, go for the broadest bandwidth possible. ISP's differ in the type of line they offer. The broadest bandwidth currently offered is a T1 line. A T1 is twelve times the highest speeds possible on ISDN and more than twice as fast as the entry level DSL service. It is also important to note that a T1 connection is full duplex. This means that your upload speed is not affected by your download transmissions. Therefore, you have the ability to both send and receive information at high speeds at the same time.

The next most important difference that really sets a broadband connection, especially a T1, line apart from most modems, is reliability. Since a T1 connection is dedicated to the customer's equipment, provider's equipment, and the telephone company's digital wires there is the least chance of the connection being interrupted. Furthermore, if the service is ever interrupted, response time for repair is generally much quicker on a T1 level service.

Your Server. The speed of the server you are accessing affects the speed of your download. The number of simultaneous connections possible also affect the regularity of connection and speed of your download.

## INTEGRATION OF THE WORLD WIDE WEB INTO THE INSTRUCTIONAL DESIGN

A goal states the exact aim, purpose, or end to any course of action. The statement is a point of departure from which the more specific and complete operational objectives are developed. Goals are written in terms of learner behavior, not teacher behavior. From the learner's perspective, a goal is a consequence he expects to attain. The instructional designer then conducts a rigorous task analysis identifying those learning tasks that when completed will lead to goal achievement. These tasks do not need to be operationalized at this point. The tasks must be reviewed to make sure that none are extraneous to goal achievement and that all tasks that are needed for goal achievement are included.

Once the process of isolating the tasks has been completed, the tasks are then operationalized; that is, they are converted to objectives. Like goals the objectives are written from the point of view of the learner. In other words, what will the learner do to achieve the goal—not what the teacher/trainer will do. A plan denoting what the teacher /trainer will do is called a lesson plan. To be an operationalized objective, they must specify a terminal behavior for the learner, the conditions under which the behavior will manifest itself, and the standard, or level, of performance by the learner of the objective.

It is critical to emphasize that objectives should be written at the highest level possible. The paradigm used in this book is based on Bloom's Taxonomy which describes a hierarchy of objectives within three domains of learning. Each level within the hierarchy is built on lower levels which are necessary to function at the higher level. For example for learners to synthesize they must first complete lower level activities. The hierarchy goes from the lowest level, knowledge, through comprehension, application, and analysis to synthesis. Synthesis is the process of arranging the content from the lower levels into a new whole.

Before engaging in formal learning events, the instructor and learner should agree upon an objective. This objective could conceivably be the same for all learners in a group, or, it could be personalized for a specific learner. At this point a rationale should be presented in which the learner accepts the relevance of the objective, indicates willingness to engage in the learning tasks, and in fact submits controlled attention to the learning tasks.

All learning events or objectives should generate a product. In other words, the learner should demonstrate synthesis by externalizing achievement of the objective. Simply stated, higher level learning involves a process in which the learner internalizes information along a continuum. Learners receive the information through the senses, process it according to their schemata, and organize it into a new construct. To demonstrate that construct learners should be encouraged, or even expected to generate a product. Perhaps the highest level of learning is one in which a learner is expected to teach others, or even to teach others to teach.

Too often the critics of education have called for the process to include only the lower levels of internalization—sometimes only the knowledge level. Rather than the end, this level is only the beginning of the more sophisticated process of internalizing/externalizing.

How does a learner internalize information? The learner activities allowing internalizing include reading (textbook and supplemental materials), listening (lectures by teacher, audio tapes, records, radio, television, and peer instruction among others), viewing (overhead transparencies, slides, filmstrips, motion pictures, videos, and presentations such as Powerpoint® via the computer), interactive with printed materials such as handouts and worksheets, and combinations of these media. For example, a teacher's lecture may combine overhead transparencies, a worksheet, and a textbook reading.

Learners should be given an option to choose from among several alternatives for assimilating lower cognitive information. No single option is likely to meet the needs of every learner. Some learners might choose all alternatives, or the instructor might prescribe all alternatives to a specific learner or group of learners, but the intended outcome is that the learner will internalize enough information to create a new construct, through synthesis, called for in the objective. Micro-teaching and a highly individualized program of instruction along with a team approach (including learners themselves) will be necessary to implement this approach.

The World Wide Web is an excellent source for internalization. Learners can function independently locating information on the Web using search engines and intuitive searches, or the instructor can provide direction by specifying search terms for search engines. Individual's research skills can be honed by developing search strategies to locate information. Critical thinking skills must be employed by the instructor and the learner to analyze the relevancy and credibility of the Web site. At times the instructor may wish to provide a bibliography of URL's for the learner to use.

The World Wide Web can be used to manage the educational process, the instructor can teach about the World Wide Web, and perhaps most importantly, teach with the World Wide Web.

Management. Course syllabi, class handouts, and class announcements can be posted on the Web. Communication with parents can be accomplished via the Web. Tests can be administered via the Web. Microteaching lessons (sometimes called mini-lessons) can be posted. Student performance can be monitored (password protected) by both students and parents. Students can submit classwork, projects, papers, and so forth, via the Web and instructors can download these, evaluate them, and return them to the learner via the Web. Students can use e-mail to communicate with each other and with their instructor about class matters and as a help-line. Well regulated (and monitored) chat rooms which are password protected have proved to be invaluable.

About. Before learners can be efficient in using the Web, they must develop certain skills and knowledge about the Web. At the time of this writing, most learners were far more skilled and knowledgeable about the Web than were their instructors. There appears to be a generation gap—the instructors still express a misoneism, or phobia about the PC.

The World Wide Web is changing at a phenomenal rate. Almost daily new techniques and applications are developed. Not only do students need, and many already have, skills in using the Web to obtain information. They also need skills in creating messages for the Web. Skills in using html code are important. Increasingly, programs such as FrontPage® make it easier to write for the Web. Learners need skills in creating graphics for the Web. They will need skills in digital photography, scanning, and downloading still images from the Web. File Transfer Protocol (FTP) skills are critical to have.

Navigational skills are important. Navigational skills include such things as configuring a browser for e-mail using search engines. Problem-solving skills need to be developed.

Exercises designed to develop and refine skills in using the World Wide Web can be integrated into other classroom instruction. One of the popular exercises is a scavenger hunt. Learners are given a list of topics, or questions, and asked to surf the Web to find the answers. The process hones navigational skills required to be successful.

With. As previously discussed, the World Wide Web can be used by learners to internalize information. The learner and instructor appear to be limited only by their creativity. Ideally, each learner should have access to the Web in the classroom and at home.

Learning activities can be designed which require the leaner to use the Web as a source of information either as expository material or in database format. Interaction can come either through the Website itself or with supplemental materials provided by the instructor.

Creativity is the goal of learning. Each learning event should generate a product. This creative product, or externalization, demonstrates achievement of the objective. Each learner should be given the opportunity to produce a Web site as a part of externalization. In doing so, they are able to use the synthesis they generated from the internalization to "teach" others.

It is not the intent of this chapter, or book, to be a model for the development of specific activities; rather, it is to create awareness of possibilities and to encourage attitudes leading to sophisticated usage of perhaps the greatest instructional tool since the printing press.

## CHAPTER 6

# E-LEARNING

*We know, purely and simply, that every single child must have access to a computer, must understand it, must have access to good software and good teachers and to the Internet, so that every person will have the opportunity to make the most of his or her own life.*

—President Clinton

As we enter a new century, indeed a new millennium, educators are faced with yet another panacea for solving the problems associated with effective and efficient teaching and learning. In the recent past we educators have been faced with "solutions" ranging from clamoring for "the good old days" through a total commitment to the latest gadgetry and gimmickry. The fact is that none of the approaches contained within the spectrum are a panacea. E-learning is not a universal solution. It is complex. It demands new understanding, new leadership. To become leaders in e-learning, first one must understand the strengths and weaknesses of e- learning. For any approach to be effective and efficient it must be founded upon sound principles of instructional design and development. For that reason, the discussion presented in this chapter on e-learning is predicated upon the application of the sound design presented in the previous chapters in this book.

### Definition

Electronic learning (e-learning) covers a wide set of applications and processes such as Web-based learning, computer-based learning, virtual

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INSTRUCTIONAL DESIGN: SYSTEM STRATEGIES, pages 187–196

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classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio- and videotape, satellite broadcast, interactive video, and CD-ROM.

E-learning is not without its detractors as well as its advocates. Some detractors use the age-old argument that the intent of e-learning advocates is to replace teachers. Our argument is, somewhat humorously, that if teachers can be replaced with e-learning applications they should be replaced. In the final analysis e-learning will not cost as much and the care and feeding of teachers and is a lot simpler. Seriously, teachers will not be, cannot be, replaced with e-learning. A liberal education requires that learning occur in an environment of community in a mentoring relationship between learner and instructor. The role of the teacher must change, and is changing, from that of a dispenser of information to that of a facilitator and of a guide. There is so much to learn, and information is so easily and readily available, that our paradigm of teaching and learning is changing to place even more emphasis on learning how to learn.

## Challenges

However, several issues, or challenges, face e-learning. These challenges will be temporary as we place added emphasis upon their resolution. The issues include the following:

1. Schools, teachers, and students may be required to purchase or rent new computer equipment. This will be a problem for the foreseeable future. Advances in both hardware and software occur so rapidly that they become outdated quickly. With demand and competition, the prices of both hardware and software are coming down at a rapid clip and will continue to do so.

2. Technical difficulties or operator error may hamper students and instructors. Computer use is becoming more user friendly. The operating systems are becoming more intuitive and easier to use.

3. Students and instructors may have gaps in their computer knowledge and skills so they will require training in computer basics before they can start the online learning training. Over time, this should be less of a problem. Computers are becoming part of our environmental surround. Hardly anyone requires instruction in the use of a telephone, or most devices that we use daily (with the possible exception of setting the clock on a VCR), so as time goes by the PC in its various guises is going to become more and more part of our knowledge/experience base.

4. Using telephones lines and Internet service providers to access Internet services, when required, leads to high user fees in many parts of the world. This is especially a problem in third-world countries and in rural

areas of the United States. However, most states have begun initiatives to bring broad-band, high speed Internet services to rural areas at an affordable cost. For example, in North Carolina the Rural Internet Access Authority (RIAA) under the auspices of e-NC Initiative, is a grassroots effort to connect all of North Carolina to the Internet and a better future. The Rural Internet Access Authority is leading the e-NC Initiative. In August 2000, the North Carolina General Assembly established the authority and charged it with making affordable, high-speed Internet access available to every area of North Carolina by 2003 (see www.e-nc.com).

5. Initial costs of developing courses may be considerable, depending on the approach taken. However, validated learning based on sound instructional design is usually economical when considering the alternative.

6. Instructors may need to become familiar with electronic text books, Internet-based research material, copyright, and other e-learning related topics. This should be part of their pre-service preparation, certification renewal, continuing education and in-service education

7. Internet bandwidth may not be robust enough to support the desired level of multimedia. Satellite alternatives, wireless, Cable, ISDN, and T1/T3 lines are making major dents in this argument.

8. People working in the e-learning field at an individual location may be pioneers and not have the support of a network of more experienced colleagues. This is an age-old problem of resistance to change. It can be overcome with incentives and leadership.

## Efficacy

Detractors of e-learning frequently express the fear that teachers will be replaced. In reality, e-learning fosters interaction among students and instructors. Interaction stimulates understanding and the recall of information.

Educators today acknowledge that learners have different learning ways and at different rates. Not all learners learn the same way. E-learning accommodates different learning styles and fosters learning through a variety of activities that apply to different learning styles. It fosters self-paced learning whereby students can learn at the rate they prefer.

The logistics related to learning are expedited. E-learning is convenient for students to access any time, any place while reducing travel time and travel costs for students, and is convenient for instructors to provide for access any time, any place. E-learning permits instructors to develop materials using the world-wide resources of the Web. In fact, learners have to access to information worldwide through hyperlinks thereby finding information relevant to their personal needs. Further, e-learning allows students to select learning materials, or to be directed to content that meets their level of knowledge, interest and what they need to know to perform more effectively in their particular activity. It allows instructors to communicate information in a more engaging fashion than in strictly text-based distance education programs. E-learning offers a wide-range of text, diagrams and images with video and sound, including virtual reality technology that in the future will improve the effectiveness of the approach even further. Frequently instructors have to spend inordinate amounts of time with remedial instruction. E-learning allows instructors to package essential information (micro-teaching) for all students to access on a per need basis. Instructors can then concentrate on high level activities.

E-learning encourages students to take responsibility for their own learning and by succeeding builds self-knowledge and self-confidence. The knowledge and skills of the Internet will help learners throughout their lives. John Dewey said, "Education is a process of living, not just of preparing for a living." The use of e-learning is a process not only of preparing for learning, but an integral part of lifelong learning.

Advantages of e-learning for administrators include the following:

1. E-learning accommodates automated, continuous assessment of student progress.
2. Reduces capital costs associated with traditional bricks and mortar schools and training facilities.
3. Can be accessed by a variety of platforms such as Windows, UNIX, and Mac because they all read html files.
4. Template approach to developing online learning engenders consistency.
5. Allows institutions to build the e-learning modules from courses of leading instructors.
6. Traditional library collections can be de-emphasized because even more information is available via the Internet resulting in substantial savings which can be diverted to instructional development. This results in supporting developers to design, in very specific details, for specific knowledge and shills not limited to introduction of content, summary, or enrichment. Instructional developers can use e-learning to set a framework for standardized course delivery. It can facilitate modifying training and education materials by using html code. E-learning allows developers to design once and use the same module in several programs, by using 'template-like' learning while promoting the orderly layout of course materials, assignments and general administration through a Web site.

## The National Educational Technology Plan

In 1996 the United States Secretary of Education released the nation's first educational technology plan in response to the dramatic changes and technology advances in the early 1990s. The plan, entitled Getting America's Students ready for the twenty first century: Meeting the Technology Literacy Challenge presented a vision for the effective use of technology in k-12 schools.

Research studies and results demonstrate that educational programs that employ emerging technologies yield positive results for students and teachers. Continued adoption of new and emerging technologies by schools offer even more hope for educational improvement. Students will better be able to comprehend difficult-to-understand concepts, teachers will better be able to provide their students with access to information and resources, and students will have their individual learning needs met more effectively.

Given the tremendous progress made in integrating technology into teaching and learning and the continued advances in the affordability and capabilities of technology, the need to move beyond the 1996 goals became evident. In the fall of 1999, the U.S. Department of Education undertook a strategic review and revision of the national educational technology plan, in consultation with the full range of stakeholders: educators, researchers, policymakers, students, parents, and higher education, industry, and other leaders. The outcome of this strategic review was five new national goals for technology in education.

## Goals

The U.S. Department of Education suggested that the nation should pledge to meet these five new goals:

**Goal 1**: All students and teachers will have access to information technology in their classrooms, schools, communities, and home.

Access to instructional technology, especially the Internet, by students and teachers in the United States is an integral part of school improvement and reform efforts in the twentieth century. Access to the Internet will help end the isolation of teachers; exponentially expand the resources for teaching and learning in schools and classrooms; provide more challenging, authentic, and higher-order learning experiences for students; and make schools and teachers more accountable to parents and communities.

High speed access to the Internet access is critical. Broadband access will be the new standard. Dial-up POT 56K modem access is slow and unreliable and cannot support required interactivity or rich multimedia. It will become increasingly important to build and support network infrastructures—wired or wireless, desktop or handheld—that allow multiple devices to connect simultaneously to the Internet throughout every school building and community in the nation.

To realize the goal of universal access to educational technology, especially the internet, the U.S. Department of education says we need to ensure sustained and predictable funding for technology; ensure that technology plans reflect the educational needs of students and are regularly updated; improve the affordability, reliability and ease of use of educational technology; ensure that school buildings and facilities are modern; and ensure that all students have equal opportunities to access and use technology.

**Goal 2:** All teachers will use technology effectively to help students achieve high academic standards.

Most teachers have been prepared for a model of teaching dramatically out of step with what is needed to prepare the nation's students for the challenges they will face in the future. For the nation to have effective twenty first-century teachers requires more than just providing sufficient access to technology for teaching and learning. We should improve the preparation of new teachers, including their knowledge of how to use technology for effective teaching and learning; increase the quantity, quality and coherence of technology-focused activities aimed at the professional development of teachers; and, improve the instructional support available to teachers who use technology. Teachers need skills in instructional design. Teachers need to integrate new and emerging technologies into their curriculum. The fact of ownership of the new technologies is the antithesis of effective teaching and learning. Sadly, many states have equated ownership of hardware with proper usage and have made inordinate investment in that area while ignoring teacher preparation. This appears to especially be the case in teacher preparation programs.

**Goal 3:** All students will have technology and information literacy skills.

For students to have the skills they need to participate fully in our technological society is a priority for the nation. Like operational objectives being relegated to lower cognitive levels, to limit learners to a mere checklist of basic technological skills is just the beginning of becoming proficient technology users. Problem-solving skills, such as how to define tasks, identify information seeking strategies, locate and access information, determine information's relevance, organize and communicate the results of the information problem-solving effort and evaluate the effectiveness and efficiency of the solution are the higher levels necessary to meet the priority. Most states, to their credit, have such a checklist of basic skills. Some even have the greater vision. It should also be the nation's priority to raise academic standards for students; to reflect the fact that the criteria for an educated citizenry continues to rise to reflect changes in a technological society.

We must ensure that in requiring these skills of students that they will be available to all students as they progress through school, regardless of personal or socioeconomic factors. To ensure that students are prepared for the challenges in their daily life as well as their future, we should include technology and information literacy in state and local standards for what students should know and be able to do. These standards should include using technology appropriately and responsibly and developing new student assessment tools.

**Goal 4:** Research and evaluation will improve the next generation of technology applications for teaching and learning.

We are at the beginnings of a technological revolution that is bringing dramatic changes to our society. This technological revolution will translate into a similar revolution in teaching and learning but it will not be easy. The human condition appears to resist change in almost everything—especially our institutions. Educators do not automatically include everything they know about teaching and learning. In fact, education appears to be the only profession that does not include everything it knows to be effective.

While we have learned a tremendous amount about the implementation and use of technologies for teaching and learning in the past few years, the need for an expanded, ongoing national research and evaluation program to improve the next generation of technology applications for teaching and learning is profound. But, in addition, leadership in integrating all that we now know into teaching and learning is critical.

To achieve this integration of research findings requires a sustained effort of all the concerned publics of education: the community (especially parents), the schools (faculties, administrators, boards, accrediting agencies), subject-matter experts, and specialists.

According to the U.S. Department of Education, numerous organizations have pointed out the urgency of this national need, including the President's Committee of Advisors on Science and Technology, the National Science Foundation, the National Research Council, private charitable foundations, independent research institutes and representatives of academia.

In other words, initiation of a systematic agenda of research and evaluation on technology applications for teaching and learning, encouragement of state and local evaluations of technology programs, and support the dissemination and use of research-based information to improve teaching and learning should be the priority.

**Goal 5:** Digital content and networked applications will transform teaching and learning.

Digital content and digital applications is the best support changes in our approaches to teaching and learning. Digital content and networked applications must be independently judged to be of high quality in pedagogical effectiveness, well-documented, comprehensive and available for all grades and subject areas. The digital content and applications must motivate students. In addition, they must be easy to find and access, easy for students and teachers to use, and accessible to people with disabilities.

Students are better able to comprehend difficult-to-understand concepts through specific applications of digital content and networked applications, especially in the area of microteaching. Research findings support the hypothesis that by providing better access to information and resources and meeting individual needs, which networked applications allow, students are more highly motivated. In addition, technology applications can increase parental involvement and improve the accountability and efficiency of school administration.

Educational administrators and policymakers must be technologically literate as well. They need to support efforts:

> To increase our understanding of how to improve teaching and learning through partnerships within and across sectors; identify leadership opportunities provided by technology to offer better ways of accomplishing educational goals; continue and expand efforts to digitize rich educational materials consistent with copyright laws; encourage the aggregation of demand for resources and services to attract better and more effective technology-based services for teaching and learning; support educators and technologists in defining what digital content and networked applications should be available to support teaching and learning; remove barriers to purchasing digital content and networked applications; recognize developers of high-quality digital content and networked applications and exemplary adoption of educational technologies; and support the integration of digital content and networked applications into state and local standards and curricular frameworks (U.S. Department of Education, 2000),

## PROGRESS

At the start of 1990, there was one instructional computer for every 20 students. In 1998, there was more than one instructional computer for every six students. Between 1993 and 1999, the percentage of schools with access to the Internet grew from 35% to 95%. During the same period, classrooms with Internet increased from three percent to 65%. In 1994, 51% of teachers had recently participated in professional development on the use of technology. In 1998, 78% of teachers received professional development that focused on the integration of technology in the grade and subject they taught. The proportion of teachers using the Internet in teaching continues to climb along with school connectivity—from 65% in 1998 to 85% in 2000.

The use of technology in education must remain a national priority. It must be at the core of the educational experience, not at the periphery. Now is the time to renew our commitment to the future by challenging the nation to take bold action in hastening the coming of the future of education. The leadership imperative is clear. Collectively, these new goals for technology in education represent an updated, high-level strategy for ensuring that all students will benefit from enhanced learning opportunities afforded by new and emerging communications and information technologies.

In 2001, a prominent bipartisan commission of government officials, educators and industry leaders urged the incoming Bush administration and the next Congress to embrace e-learning to fulfill the Internet's potential in advancing education. Bob Kerry, retiring Democratic senator from Nebraska and chairman of the Web-based Education Commission said, "We must immediately put to rest the notion that full development of Web-based technology for education is a choice."

E-learning is an academic area in which all teachers and trainers should be competent. It is virtually impossible to engage in teaching, training, and learning without utilizing the knowledge and skills in this field. With the advances made in delivery systems, software development, and pedagogy at the end of the twentieth century and continuing into the twenty first century, the way our society envisions the process of teaching and learning is changing. If not a completely new paradigm, there is at least the proverbial paradigm shift. We appear to be decentralizing the process. Instead of the teaching/learning being teacher dominated, that is the role of the teacher being a dispenser of information in a closed system, the process is teacher guided and the learner has input into what is to be learned and how, building upon prior knowledge. The learner has an incredible number of options to internalize the foundations of learning in knowledge, comprehension, and application. Using the World Wide Web, the leading libraries, databases, and storehouses of knowledge are at everyone's fingertips. Opportunities for learners to externalize, demonstrating their analysis, synthesis, and evaluation competencies are greater than ever before. Learners can be given almost unlimited opportunities to construct meaning and demonstrate their construction in non-traditional ways. No longer must learning be directed toward the lower levels. Learners now have resources to develop higher order thinking skills and to demonstrate them. To fear e-learning and the constructivist approach with this cornucopia probably is natural. Room for abuse and misuse is enormous enough for many to decry their appliance.

The trepidation caused in the uninitiated by the e-learning constructivist approach is nothing to fear if the tenets of instructional design are incorporated into the curriculum. This book advocates a process, which enables the teaching/learning process to capitalize on the constructivist approach in a non-threatening, coherent fashion.

## FINAL

Make sure that your instructional design in e-learning is aesthetically packaged regardless of the media that are integrated into the final package. While packaging can be just window dressing, a professionally developed instructional design of the quality that you have done deserves no less. Take pride in your accomplishments in instructional design and e-learning. Realize that you have developed skills that are highly sought by school systems and by training programs in the military, in the health and allied agencies, in religious education, in the corporate setting, and in business and industry. Realize that you now have skills that will cause you to be sought as a consultant.

Realize that this design is written from the point of view of what the learner is going to do. This is a major point differentiating what you, an instructional designer, now can do from those who limit themselves to making "lesson plans." If you feel a lesson plan is in order that is describing what the teacher is going to do, go ahead and make one. Just realize that it is not an instructional design and will not take the place of one. Correct, gently, those who call your design a lesson plan.

Make every effort to incorporate all that you know about teaching and learning into your designs. Be on the cutting edge in developing techniques that do not fail. Be diligent in becoming contemporary in your knowledge and skills of pedagogy.

Finally, there is a language of the profession. Use that language routinely, especially in situations in which you are dealing with other professionals. One of the "hits" that contemporary teachers are taking at the beginning of the twenty-first century is that they are incompetent and use jargon. All professions, including medicine and law, have a highly specialized language. Physicians and attorneys use that language routinely without apologizing to anyone. In fact, using their specialized language may enhance their prestige. Educators, especially instructional designers and instructional technologists should do no less.

# AFTERWORD

Instructional Technology is an academic area in which all teachers and trainers should be competent. It is virtually impossible to engage in teaching, training, and learning without utilizing the knowledge and skills in this field. With the advances made in delivery systems, software development, and pedagogy at the end of the twentieth century and continuing into the twenty-first century, the way our society envisions the process of teaching and learning is changing. If not a completely new paradigm, there is at least the proverbial paradigm shift. We appear to be decentralizing the process. Instead of the teaching/learning being teacher dominated, that is the role of the teacher being a dispenser of information in a closed system, the process is teacher guided and the learner has input into what is to be learned and how, building upon prior knowledge. The learner has an incredible number of options to internalize the foundations of learning in knowledge, comprehension, and application. Using the tools of e-learning, especially the World Wide Web, the world's leading libraries, databases, and storehouses of knowledge are at everyone's fingertips. Opportunities for learners to externalize, demonstrating their analysis, synthesis, and evaluation competencies are greater than ever before. Learners can be given almost unlimited opportunities to construct meaning and demonstrate their construction in non-traditional ways. No longer must learning be directed toward the lower levels. Learners now have resources to develop higher order thinking skills and to demonstrate them. To fear the constructivist approach with this cornucopia probably is natural. Room for abuse and misuse is enormous enough for many to decry their appliance.

The trepidation caused in the uninitiated by this constructivist approach is nothing to fear if the tenets of instructional design are incorporated into the curriculum. This book advocates a process which enables

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INSTRUCTIONAL DESIGN: SYSTEM STRATEGIES, pages 197–200

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the teaching/learning process to capitalize on the constructivist approach in a non-threatening, coherent fashion.

## THE INSTRUCTIONAL DESIGN PACKAGE

The completed instructional design should be packaged in a manner to make it usable by anyone who chooses. The completed design should be bound in protective cover and should contain the following components:

1. A title/cover page.
2. An overview to the learning event containing a statement(s) about the philosophy under-girding the design, the audience or learner for whom the design is intended, and the scope of the learning event.
3. A goal statement followed by a statement about the key elements contributing to the formulation of the goal, for example, the expectations of the society, the expectations of the subject specialists, and the needs and interests of the learner. The philosophical filter as well as the learning theory filter should be addressed in this statement.
4. A rationale. Present an answer to the learner to the question "Why should I learn this?" Include in your rationale inductive, deductive, intrinsic, and/or exhortative arguments. Remember that usually the closer to the present moment the learner finds utility in what he is asked to learn the more likely he is to submit controlled attention to the learning task. Not only should "why" be answered in the rationale but also "where," "how," and "when."
5. A motivational strategy. Mazlow's Hierarchy provides a good approach. Mazlow described an individual's needs as residing at a particular place at a given time. He identified physiological, psychological, sociological, ego, and self-fulfillment (or self-actualized) levels. Earlier in this book a definition of learning was presented. Learning was defined "a desired behavioral change that is relatively stable over a relatively extended period of time and void of undesirable side effects." We often unwittingly withhold satisfaction of other physiological, psychological, sociological, ego, and self-fulfillment needs of the learner thus negatively affecting the teaching/learning process.
6. A list of the results of a task analysis. Be sure to emphasize that accomplishment of these tasks will be evidence that the goal has been achieved.

7. A list of the operational objectives for each task. Make sure that each contains a terminal behavior, a condition, and a standard. Also, a reminder to write the objective(s) on the highest level possible. While objectives often contain characteristics of more than one domain of learning, usually an objective can be classified as primarily at one level. This is important because later the learner activities must include activities at all the lower levels.
8. Pre-tests. You should provide a means (not necessarily pencil and paper tests) to determine two things: (1) Does the learner possess the entry behaviors to be successful? (2) Does the learner already have the skills, knowledge, or attitudes called for in the objective?
9. Advanced Organizers. Learners possess a schema within which they process information. For example, when asked to "name as many animals as you can," most learners will unconsciously group the animals as they name them. They usually will name four or five animals within a group (tigers, lions, panthers, cougars [cats] for example) then switch to another group (cows, pigs, horses, goats, [domesticated farm animals] for example) and perhaps to large jungle animals (elephants, rhinos, hippos, etc.). They will have demonstrated schema at work. The instructional designer can either provide a new schema, or suggest a schema that the learner already possesses. Regardless of which technique you choose, with an advance organizer, information processing is much easier for the learner.
10. A list of the learner activities to accompany each objective. Each objective should have learner activities at each of the levels lower than the objective. For example, if the objective is at the highest level, evaluation, then there should be learner activities requiring knowledge, comprehension, application, analysis, and synthesis.
11. A list of the media required for the learning event. First determine the need for a given medium. State in the design where that medium can be obtained, or make it a part of the package. The process should be re-emphasized that if all conditions are equal it usually is best to first borrow, then to rent, then to purchase, and finally to design and produce. Message design skills are important at this level.
12. A validation plan. With operational objectives the criterion check was written at the time the objective was written. The authors advocate two tenets: (1) every learning event should generate a product (an externalization). Do no overuse pencil and paper tests. In fact, we advocate that pencil and paper tests be used rarely. This is consistent with the contstructivist approach advocated by this book. (2) Creativity is the goal of learning. Learners should be encouraged to not be satisfied with mediocrity. The difference between mediocrity

> and excellence is attention to detail. The design should encourage excellence.

Many instructional designers give the opportunity for the learner to carry a goal beyond a required or expected level. This allows the learner to be especially creative while at the same time anchoring learning.

In addition to the combination list/narrative described above, place your completed instructional design on the form advocated throughout this book (Figure 1.1). Make sure that the design is aesthetically packaged. While packaging can be just window dressing, a professionally developed instructional design of the quality that you have done deserves no less. Take pride in your accomplishments in instructional design. Realize that you have developed skills that are highly sought by school systems and by training programs in the military, in the health and allied agencies, in religious education, in the corporate setting, and in business and industry. Realize that you now have skills that will cause you to be sought as a consultant.

Realize that this design is written from the point of view of what the learner is going to do. This is a major point differentiating what you, an instructional designer, now can do from those who limit themselves to making "lesson plans." If you feel a lesson plan is in order that is describing what the teacher is going to do, go ahead and make one. Just realize that it is not an instructional design and will not take the place of one. Correct, gently, those who call your design a lesson plan.

Make every effort to incorporate all that you know about teaching and learning into your designs. Be on the cutting edge in developing techniques that do not fail. Be diligent in becoming contemporary in your knowledge and skills of pedagogy.

Finally, there is a language of the profession. Use that language routinely, especially in situations in which you are dealing with other professionals. One of the "hits" that contemporary teachers are taking at the beginning of the twenty-first century is that they are incompetent and use jargon. All professions, including medicine and law, have a highly specialized language. Physicians and attorneys use that language routinely without apologizing to anyone. In fact, their prestige may be enhanced by using their specialized language. Educators, especially instructional designers and instructional technologists should do no less.

# APPENDIX A

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        count.cgi?page=B_Ledford&digit=2&ds=a” border=0>
<img src=“http://www.zcounter.com/c2/
        count.cgi?page=B_Ledford&digit=1&ds=a” border=0>
<img src=“http://www.zcounter.com/c2/
        count.cgi?page=B_Ledford&digit=0&ds=a” border=0>
</td></tr></table></center>
<center><font size=1 face=“Arial”>Zcounter.com <a href=“http://
        www.zcounter.com”>Free Counters</a></font></center>
<!–END Zcounter.com COUNTER CODE–>
</body>
</html>
```

This code displays the website shown in Figure A.1.

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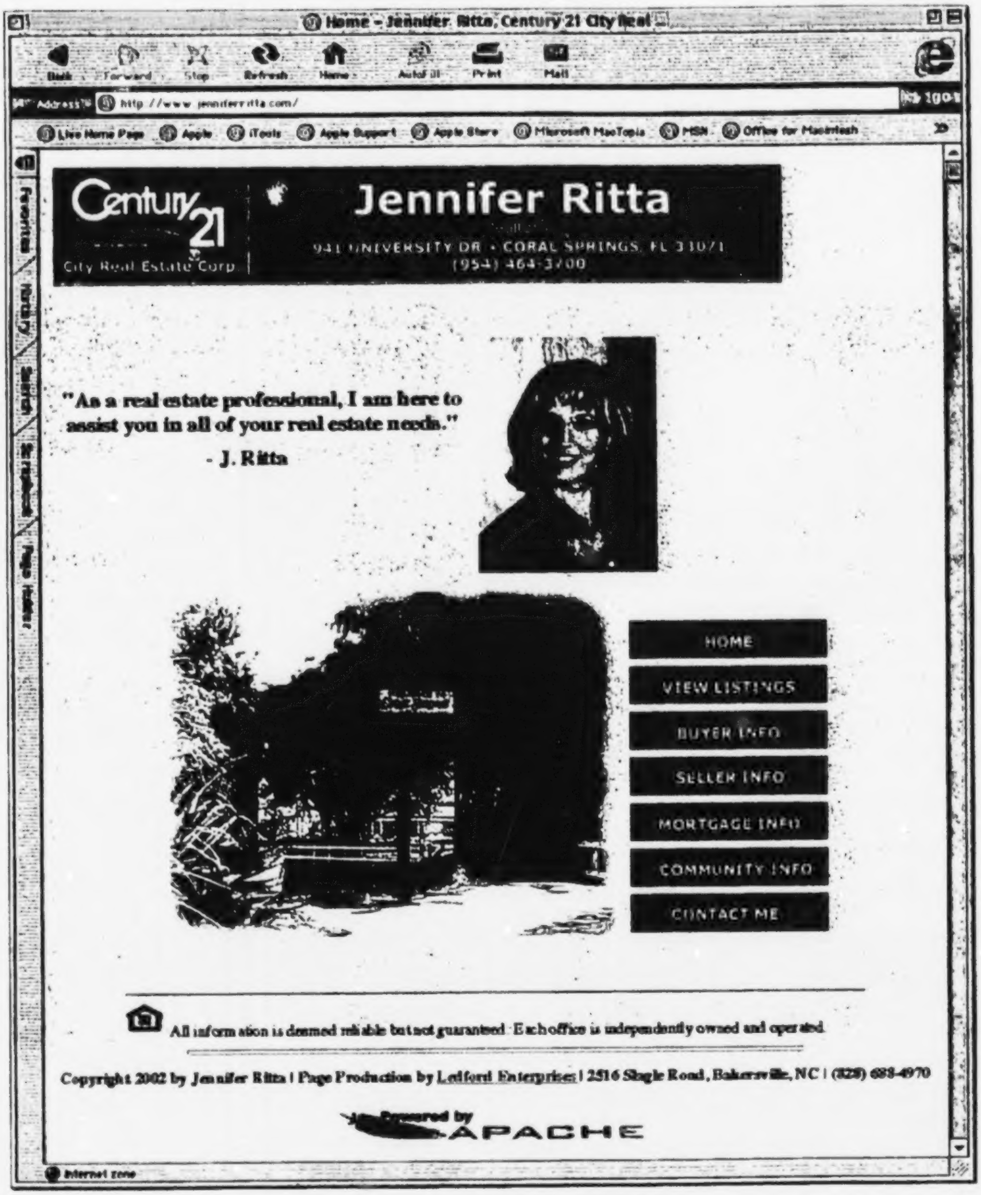
Home – Jennifer Ritta, Century 21 City Real
Back
Forward
Stop
Refresh
Home
AutoFill
Print
Mail
Address
http://www.jenniferritta.com/
go
Live Home Page
Apple
iTools
Apple Support
Apple Store
Microsoft MacTopia
MSN
Office for Macintosh
Favorites
History
Search
Scrapbook
Page Holder
Century 21
City Real Estate Corp
Jennifer Ritta
941 UNIVERSITY DR • CORAL SPRINGS, FL 33071
(954) 464-3700
HOME
VIEW LISTINGS
BUYER INFO
SELLER INFO
MORTGAGE INFO
COMMUNITY INFO
CONTACT ME
Powered by APACHE
Internet zone

"As a real estate professional, I am here to assist you in all of your real estate needs."
- J. Ritta

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Figure A.1. Resulting Web site.

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# APPENDIX B

## Reference HTML Cheatsheet

***Basic Tags***

`<html></html>`
Creates an HTML document

`<head></head>`
Sets off the title and other information that isn't displayed on the Web page itself

`<body></body>`
Sets off the visible portion of the document

***Header Tags***

`<title></title>`
Puts the name of the document in the title bar

***Body Attributes***

`<body bgcolor=?>`
Sets the background color, using name or hex value

`<body text=?>`
Sets the text color, using name or hex value

`<body link=?>`
Sets the color of links, using name or hex value

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`<body vlink=?>`
Sets the color of followed links, using name or hex value

`<body alink=?>`
Sets the color of links on click

### Text Tags

`<pre></pre>`
Creates preformatted text

`<h1></h1>`
Creates the largest headline

`<h6></h6>`
Creates the smallest headline

`<b></b>`
Creates bold text

`<i></i>`
Creates italic text

`<tt></tt>`
Creates teletype, or typewriter-style text

`<cite></cite>`
Creates a citation, usually italic

`<em></em>`
Emphasizes a word (with italic or bold)

`<strong></strong>`
Emphasizes a word (with italic or bold)

`<font size=?></font>`
Sets size of font, from 1 to 7)

`<font color=?></font>`
Sets font color, using name or hex value

### Links

`<a href="URL"></a>`
Creates a hyperlink

`<a href="mailto:EMAIL"></a>`
Creates a mailto link

`<a name="NAME"></a>`
Creates a target location within a document

`<a href="#NAME"></a>`
Links to that target location from elsewhere in the document

***Formatting***
`<p></p>`
Creates a new paragraph

`<p align=?>`
Aligns a paragraph to the left, right, or center

`<br>`
Inserts a line break

`<blockquote>`
`</blockquote>`
Indents text from both sides

`<dl></dl>`
Creates a definition list

`<dt>`
Precedes each definition term

`<dd>`
Precedes each definition

`<ol></ol>`
Creates a numbered list

`<li></li>`
Precedes each list item, and adds a number

`<ul></ul>`
Creates a bulleted list

`<div align=?>`
A generic tag used to format large blocks of HTML, also used for stylesheets

***Graphical Elements***
`<img src="name">`
Adds an image

`<img src="name" align=?>`
Aligns an image: left, right, center; bottom, top, middle

`<img src="name" border=?>`
Sets size of border around an image

`<hr>`
Inserts a horizontal rule

`<hr size=?>`
Sets size (height) of rule

`<hr width=?>`
Sets width of rule, in percentage or absolute value

`<hr noshade>`
Creates a rule without a shadow

### *Tables*

`<table></table>`
Creates a table

`<tr></tr>`
Sets off each row in a table

`<td></td>`
Sets off each cell in a row

`<th></th>`
Sets off the table header (a normal cell with bold, centered text)

### *Table Attributes*

`<table border=#>`
Sets width of border around table cells

`<table cellspacing=#>`
Sets amount of space between table cells

`<table cellpadding=#>`
Sets amount of space between a cell's border and its contents

`<table width=# or %>`
Sets width of table — in pixels or as a percentage of document width

`<tr align=?> or <td align=?>`
Sets alignment for cell(s) (left, center, or right)

`<tr valign=?> or <td valign=?>`
Sets vertical alignment for cell(s) (top, middle, or bottom)

`<td colspan=#>`
Sets number of columns a cell should span

`<td rowspan=#>`
Sets number of rows a cell should span (default=1)

`<td nowrap>`
Prevents the lines within a cell from being broken to fit

***Frames***

`<frameset></frameset>`
Replaces the <body> tag in a frames document; can also be nested in other framesets

`<frameset rows="value,value">`
Defines the rows within a frameset, using number in pixels, or percentage of width

`<frameset cols="value,value">`
Defines the columns within a frameset, using number in pixels, or percentage of

`width`
`<frame>`
Defines a single frame — or region — within a frameset

`<noframes></noframes>`
Defines what will appear on browsers that don't support frames

***Frames Attributes***

`<frame src="URL">`
Specifies which HTML document should be displayed

`<frame name="name">`
Names the frame, or region, so it may be targeted by other frames

`<frame marginwidth=#>`
Defines the left and right margins for the frame; must be equal to or greater than 1

`<frame marginheight=#>`
Defines the top and bottom margins for the frame; must be equal to or greater than 1

`<frame scrolling=VALUE>`
Sets whether the frame has a scrollbar; value may equal "yes," "no," or "auto." The default, as in ordinary documents, is auto.

`<frame noresize>`
Prevents the user from resizing a frame

***Forms***
For functional forms, you'll have to run a CGI script. The HTML just creates the appearance of a form.

`<form></form>`
Creates all forms

`<select multiple name="NAME" size=?></select>`
Creates a scrolling menu. Size sets the number of menu items visible before you need to scroll.

`<option>`
Sets off each menu item

`<select name="NAME"></select>`
Creates a pulldown menu

`<option>`
Sets off each menu item

`<textarea name="NAME" cols=40 rows=8></textarea>`
Creates a text box area. Columns set the width; rows set the height.

`<input type="checkbox" name="NAME">`
Creates a checkbox. Text follows tag.

`<input type="radio" name="NAME" value="x">`
Creates a radio button. Text follows tag

`<input type=text name="foo" size=20>`
Creates a one-line text area. Size sets length, in characters.

`<input type="submit" value="NAME">`
Creates a Submit button

`<input type="image" border=0 name="NAME" src="name.gif">`
Creates a Submit button using an image

`<input type="reset">`
Creates a Reset button

# APPENDIX C

## ASSOCIATIONS AND ORGANIZATIONS FOR INSTRUCTIONAL TECHNOLOGY

(Information about these associations and organizations was taken from the literature produced by them and posted on the World Wide Web)

### ASSOCIATION FOR EDUCATIONAL COMMUNICATIONS AND TECHNOLOGY (AECT)

AECT's mission is to provide leadership in educational communications and technology by linking professionals holding a common interest in the use of educational technology and its application to the learning process. Goals include a focus on leadership through an effort to:

1. Define those disciplines and professional activities that make up educational communications and technology;
2. Accommodate, serve, and represent professionals in educational communications and technology;
3. Develop elements and attributes that enhance the professional stature of educational communications and technology; and
4. Actively promote the improvement in learning environments through the use of educational communications and technology.

http://www.area.net

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## INTERNATIONAL SOCIETY FOR PERFORMANCE IMPROVEMENT (ISPI)

ISPI's mission is to improve the performance of individuals and organizations through the application of Human Performance Technology. Founded in 1962, the International Society for Performance Improvement (ISPI) is the leading international association dedicated to improving productivity and performance in the workplace. ISPI represents more than 10,000 international and chapter members throughout the United States, Canada, and 40 other countries. They provide conferences, books, periodicals, and research. Members include: performance technologists, training directors, human resource managers, instructional technologists, human factors practitioners, and organizational consultants. They work in a variety of settings including business, academia, government, health services, banking, and the armed forces.

http://www.ispi.org

## INTERNATIONAL SOCIETY FOR TECHNOLOGY IN EDUCATION (ISTE)

ISTE is the largest teacher-based, nonprofit organization in the field of educational technology. Its mission is to help K-12 classroom teachers and administrators share effective methods for enhancing student learning through the use of new classroom technologies. ISTE members truly are redefining the boundaries of the K-12 classroom. They form an ever-expanding network of dedicated professionals sharing classroom-proven solutions to the challenge of incorporating computers, the Internet, and other new technologies into their schools. ISTE provides conferences and workshops, publications and resources.

http://www.iste.org

## AMERICAN EDUCATIONAL RESEARCH ASSOCIATION (AERA)

The American Educational Research Association is concerned with improving the educational process by encouraging scholarly inquiry related to education and by promoting the dissemination and practical application of research results. AERA is the most prominent international professional organization with the primary goal of advancing educational research and its practical application. It's more than 22,000 members are educators; administrators; directors of research, testing or evaluation in federal, state and local agencies; counselors; evaluators; graduate students; and behavioral scientists. The broad range of disciplines represented by the membership includes education, psychology, statistics, sociology, history, economics, philosophy, anthropology, and political science.

http://www.aera.net

## ASSOCIATION FOR SUPERVISION AND CURRICULUM DEVELOPMENT (ASCD)

The Association for Supervision and Curriculum Development is a unique international, nonprofit, nonpartisan association of professional educators whose jobs cross all grade levels and subject areas. In their diversity, our members share a profound commitment to excellence in education. Founded in 1943, ASCD's mission is to forge covenants in teaching and learning for the success of all learners.

## AMERICAN SOCIETY FOR TRAINING AND DEVELOPMENT (ASTD)

Founded in 1944, ASTD is the world's premier professional association and leading resource on workplace learning and performance issues. ASTD provides information, research, analysis and practical information derived from its own research, the knowledge and experience of its members, its conferences, expositions, seminars, publications and the coalitions and partnerships it has built through research and policy work. ASTD's membership includes more than 70,000 people, working in the field of workplace performance in 100 countries worldwide. Its leadership and members work in more than 15,000 multinational corporations.

http://www.astd.org

## INTERNATIONAL VISUSAL LITERACY ASSOCIATION (IVLA)

The International Visual Literacy Association is a not-for-profit association of educators, artists, and researchers dedicated to the principles of visual literacy. IVLA was formed for the purpose of providing education, instruction and training in modes of visual communication and the application through the concept of visual literacy to individuals, groups, organizations, and to the public in general. Our members represent a wide range of disciplines including the arts, sciences, education, communication, business, videography, photography, instructional technology, health, and computer applications. We hope you will feel free to join us in the lively debates of our field, and we look forward to forming lasting professional and personal friendships.

http://www.ivla.org

# INDEX

**A**

Ability, 112
Accountability, 42, 57
Achievement levels, 8
Active participation, 128
Adaptation, 31–32
Affective, 86
Affective domain of learning, 29–30
  organization level, 29–30
  receiving level, 29–30
  responding level, 29–30
  value complex level, 29–30
  valuing level, 29–30
*Age of Manipulation, The* (Key), 166
American Educational Research Association (AERA), 214–215
American Society for Training and Development (ASTD), 215
Amplitude, 91
Analysis, 27–28
Application, 27–28
Apprenticeship, 20
Aspect ratio, 148
Association for Educational Communications and Technology (AECT), 213
Association for Supervision and Curriculum Development (ASCD), 215
Associative response, 73
Astigmatism, 94
Attention techniques, 154–155
Attitudes, 117–118
Auditory, 84, 90–92
Auditory threshold, 91
Automatic activation, 70

**B**

Balance, 149, 152–154
*Basic Principles of Curriculum and Instruction* (Tyler), 6
Becker, Hal, 70
Behavioral changes, 20
Behaviorism, 17–19
Berner-Lee, Tim, 168
Bias, 46
  of selectivity, 47
  subjectivity and, 47–48
Bloom's Taxonomy, 26–31, 37
Brightness, 93
Browsers, 169–171
Bulletin boards, 140

**C**

Cable modem, 178–179
Cable Modem Termination System (CMTS), 179
California Achievement Test (CAT), 54
Catalytic agent, 128
CERN (Conseil Européen pour las Recherche Nucleaire), 168
Chalkboards, 140
Classical conditioning, 17, 73

Closeness of fit, 21
Cognitive development, 19
Cognitive domain of learning, 27–29
  analysis, 27
  application, 27
  comprehension, 27
  evaluation, 28–29
  knowledge, 27
  synthesis, 27
Cognitive learning skills, 84, 105–106
Cognitive mapping, 9–10
Cognitive psychology research, 23
Cognitive style, 9
Coherence of presentation, 104
Collective consciousness, 66, 76
Color blindness, 93
  dichromatic color blindness, 93
  total color blindness, 93
Com (commercial usage), 175
Communication, 104
Complex overt response, 31–32
Comprehension, 27–28
Computation, 85, 106–107
Computer-assisted instruction (C.A.I.), 18
Conditions of learning (Gagne), 18
Cone of Experience (Dale), 138
Consciousness, 69–71
Constructivism, 19–21
  history of, 20–21
  zone of proximal development, 20
Convention display booths, 140
Cookies, 181–182
Creativity, 61
Criterion-referenced evaluation, 8, 50–53
  assumptions of, 50
  levels of evaluation, 51
  normative-referenced evaluation vs., 51–53
Cultural determinants, 85–86, 89

D

Dale, Edgar, 138
Dale's Cone of Experience, 138
Decibels, 91
Decoding, 66
*Déjà vu* experiences, 71
Density, 63
Developmental testing, 58–59
Dewey, John, 11, 190
Diagrammatic interpretation, 85, 109
Diagrammatic planning, 85, 107–109
Dichromatic color blindness, 93
Dignity, 57
Diplopia, 94
Direction, 137
Discrimination, 49
Distractibility index, 113
  concentration, 112
  idea traffic, 112
  participation-confusion, 112
Dominance techniques, 151
DSL (Digital Subscriber Line), 178

E

E-learning, 187–196
  advantages of, 190
  challenges, 188–189
  definition, 187–188
  efficacy, 189–190
  goals of, 191–194
  National Education Technology Plan, 191
  progress, 194–196
Edu (educational institutions), 175
Educational psychology, 19–20
Educational purposes/experiences, 6
Educational sources (media), 40–42
Embedding, 77–81
Empathic, 86, 130
Encoding, 66
Engelbart, Max, 26
Environmental surround, 76
Esthetics, 86, 131
Ethics, 86, 129
Ethnic concepts, 85, 117–118
Evaluation, 28–29, 49, 137; *see also* Criterion-referenced evaluation;

Learner analysis; Normative-referenced evaluation
  bias in, 46–47
  discrimination in, 49
  grade inflation, 43, 56
  normal probability and, 44–45
  role of, 2
  subjectivity and, 47–48
  validity and reliability, 48
Experiences, 136
  Dale's Cone of Experience, 138
  direction, 137
  evaluation, 137
  performance, 137
  showing, 137
  supervision, 137
  telling, 137
  traditional learning format, 137
Externalization, 31, 33–34, 63, 67
Eye direction, 147

**F**

Fairs, 140
Family, 85, 118–119
Family mores, 122
Family status, 116
Feedback, 4, 10
Figure-ground reversals, 77–81
File Transfer Protocol (FTP), 185
Flannel boards, 140
Followership, 115
Frequency, 91
Freud, Sigmund, 68, 72
Furst, Edward, 26

**G**

Gagne's conditions of learning, 18
General education, 10
Global village, 165–167
Goals, 2, 4
  characteristics of, 5
  fundamental questions of, 6
  learner behavior and, 5–6
  learner as source, 7–10
  motivation and, 16
  philosophical screen, 13–14
  relevance of, 15
  society as source, 11–13
  subject specialist as source, 10–11
  Tyler model for goal setting, 6–7
Gogli tendon, 101
Gov (government agencies), 175
Grade inflation, 43, 56
Grade scores, 44; *see also* Evaluation
  bias of, 46–47
  distribution curve, 46
  normal probability and, 44–45
Grid patterns, 145
Guided response, 31–32

**H**

Harmony, 153–154
Harvard Group Scale for Hypnotic Susceptibility, 71
Hertz, 91
*Hidden Persuaders, The* (Packard), 80
Hill, Joseph E., 9
Hill, Walter, 26
Histrionics, 86, 132
Hook and loop boards, 140
Horizontal display, 140, 146
Html (HyperText Markup Language), 169, 173, 207–212
173, 207–212
Http (HyperText Transport Protocol), 169, 172–173
Hue, 93
Hypermedia, 168–169
Hyperopia, 93
Hypertext, 168–169
HyperText Markup Language (HTML), 169, 173, 207–212
HyperText Transport Protocol (HTTP), 169, 172–173

**I**

Iconic representations, 103

Individually Prescribed Instruction (IPI), 52
Information processing theory, 67
Instructional design, 135, 197–200
  World Wide Web and, 183–186
Instructional design package, 198–200
Instructional Design Paradigm, 3–4
Instructional design process; *see also* Goals; Learner analysis
  display format for, 36
  instructional technology and, 1–3
  learner activities, 36–38
  operational objectives, 23–25
  overview of, 42
  perception and, 66
  purposes of, 1
  rigor of, 2–3
  role of evaluation, 2
  role of media, 39–40
  task analysis, 21–23
  taxonomy of, 26–27
Instructional media; *see* Media
Instructional technologists, 1–2
  accountability of, 42, 57
  lesson plans and, 24–25
Intel Indeo, 172
Interactional-transactional patterns, 86, 90
Internalization, 31, 33, 62, 67
International Society for Performance Improvement (ISPI), 214
International Society for Technology in Education (ISTE), 214
International Visual Literacy Association (IVLA), 62, 215–216
Internet, 166–168
  cable modem, 178–179
  DSL (Digital Subscriber Line), 178
  history of, 167
  Internet Service Providers (ISP), 177
  IP addresses, 177
  ISDN (Integrated Services Digital Network), 177–178
  satellite, 180–181
  T1/T3 line, 179–180
Internet Explorer, 170
Internet Service Providers (ISP), 177, 180
Iowa Test of Basic Skills (ITBS), 54
IP addresses, 177
ISDN (Integrated Services Digital Network), 177–178
Item writing, 48–49

J

Jacksonian philosophy, 57
Java/JavaScript/Applets, 182–183
Jung, Karl, 66, 68, 71–72, 76, 80

K

Kerry, Bob, 195
Key, Wilson Bryan, 77, 166
Kinesics, 86, 125–126
Kinesthetics, 84, 101–102
Knowledge, 27–28
Krathwohl, David, 26

L

Layout and design; *see also* Visuals
  media for instruction, 159–163
  principles of, 135–156
Leadership, 115, 125, 127
Learner activities, 36–38
Learner analysis, 7–8, 83–88
  affective, 86, 90
  auditory, 90–91
  cognitive learning skills, 105–106
  coherence of presentation, 104
  color blindness, 93
  computation, 106–107
  cultural determinants, 85–86, 89
  diagrammatic interpretation, 109
  diagrammatic planning, 107–109
  empathic, 130
  esthetics, 131
  ethics, 129
  ethnic, 117–118
  example of, 87
  family, 118
  as goal source, 7–10

  histrionics, 132
  implications, 133
  interactional-transactional patterns, 86, 90
  interest of, 8–9
  kinesics, 125–126
  kinesthetic, 101–102
  listening, 113–114
  mores, 121–123
  needs analysis, 8
  olfactory classification, 95
  oral communication skills, 85, 89
  peer group, 120
  personal identity component, 85, 89
  politics, 124–125
  proprioceptive, 100–101
  proxemics, 126–127
  reading, 102–104
  religion, 119–120
  savory discrimination, 96–97
  sensory-motor component, 84, 88
  social agency, 123–124
  spatial relationships, 85, 88
  speaking, 110–113
  structure analysis, 110
  superstructure of, 84–88
  symbol manipulation component, 84–85, 88
  synnoetics, 115–116
  tactile discrimination, 97–100
  techniques for, 9–10
  transactionals, 127–128
  visual, 92–93
  visual defects, 93–94
  writing, 104
Learner behavior/needs, 5–6, 8
Learning
  behaviorism and, 18
  defined, 25, 39
  internalization/externalization of, 31, 33, 62, 67
  perception and, 71
  perspective and, 31
  tachistoscope and, 74–75
Learning event, 37, 133
Learning event design, 58
Learning theories
  behaviorism, 17–19
  constructivism, 19–21
  psychology of teaching and learning, 16–17
Lesson plans, 23–24
Licensure tests, 52
Lines and attitude, 155
Listening, 85, 113–114
  confusion, 114
  dialect, 114
  interceptions, 114
  noise, 114
Lynx, 170

**M**

McLuhan, Marshall, 64, 68, 76, 79–80, 165–167
Mager's premise, 9
Magnetic boards, 140
Maslow's hierarchy of needs, 8, 198
Mastery learning model, 52
Mastery test, 52
Mechanism, 31–32
Media, 136; *see also* Visuals
  borrowing of, 40
  buying of, 41
  hot/cool media, 64–65, 79
  NICEM Index, 41
  procuring of, 40–42
  producing of, 41
  renting of, 40–41
  role of, 39–40
Media design; *see also* Visual displays
  for instruction, 159–163
  storyboarding, 159–163
Mediated learning (scaffolding), 20
Mediation, 71
Membership searching, 115
Mil (military), 175
Military mores, 122
Mock-ups, 139
Models, 139
Moderator, 127–128
Mores, 85, 121–123
  family mores, 122

  military mores, 122
  peer mores, 123
  political mores, 121
  religion mores, 121
  school mores, 122
  social agencies mores, 121
Motion media, 139
Motivation, 16
Motivational strategy, 5
Muscle spindle, 100
Museum displays, 140
Myopia, 93

## N

National Education Technology Plan, 191
NCSA (National Center for Supercomputer Applications), 168, 170
Needs analysis
  Maslow's hierarchy, 8
  Prescott's classification, 8
Net (network organizations), 175
Netscape Communicator, 170
NetShow Theater server, 171
NICEM Index, 41
Normal probability, 44–45
  distribution curve, 46
Normative-referenced evaluation, 8–9, 45, 47–49, 53–56
  comparison problems of, 55
  criterion-referenced evaluation vs., 51–53
Norms, 9

## O

Objectives, 2, 5, 35
  components of, 37
Observations, 9
Olfactory classification, 84, 95–96
Operant conditioning, 17–18
Operational objectives, 5, 23–25, 34
  characteristics of, 25–26
Optical legibility, 144
Oral communication skills, 85, 89
Org (organizations (nonprofit), 175
Organization level, 29–30
Origination, 31–32

## P

Packard, Vance, 80
Pattern, 152
Pavlov's experiments, 17
Pedagogical progress, 43–44
Peer group, 120
Peer influences, 85
Peer mores, 123
Peg boards, 140
Perception, 30, 32, 61, 65–72, 135–135
  associative response, 73
  consciousness, 69–71
  environmental surround, 76
  figure-ground and embedding, 77–81
  information processing theory, 67
  learning and, 71
  perceptual defense, 72–73
  preconscious cueing, 70
  rheostat and, 75–76
  schemata and, 66–67
  subliminal techniques/messages, 69–73, 75, 78, 80
  susceptibility to suggestion, 71
  tachistoscope and, 74–75
Perceptual defense, 72–73
Performance, 137
Permanent display panels, 140
Personal identity component, 85, 89
Perspective, 31
Philosophical screen, educational goals and, 13–14
Piaget, Jean, 19–20
Pictorial counterparts, 140, 147
Pitch, 91
Plug in applications, 170
Poetzel Effect, 72
Point-and-click, 170
Political mores, 121
Politics, 86, 124–125
Posters, 140

Preconscious cueing, 70
Prerequisite tasks, 2–3
Presbyopia, 94
Prescott's classifications of needs, 8
Pretest, 8, 199
Privacy rights, 81
Professional organizations, 11, 213–216
Progressive education philosophy, 9
Project surfaces, 140
Projection, 111
Projection requirements, 142–143
Proprioceptive, 84, 100–101
  gogli tendon, 101
  kinesthetics, 101
  muscle spindle, 100
Proxemics, 86, 126–127
Psychology of teaching/learning, 16–17
Psychomotor domain of learning, 29–31
  adaptation, 31–32
  complex overt response, 31–32
  guided response, 31–32
  mechanism, 31–32
  origination, 31–32
  perception, 29–30
  set, 29, 31
Public education, 42
Public information displays, 140
Published addresses, 176

**R**

Reading, 84, 102–104
  frustration reading level, 104
  independent reading level, 104
  instructional reading level, 104
  rate of comprehension, 102
Real Network's RealAudio, 172
Real objects (realia), 139
Receiving level, 29–30
Relevance, 15
Reliability, 48
Religion, 85, 119–120
Religion mores, 121
Responding level, 29–30
Reticular Activating System, 69
Rheostat, 75–76

**S**

Satellite, 180
Saturation, 93
Savory classification, 84, 96–97
  bitterness, 97
  saltiness, 96
  sourness, 96
  sweetness, 96
Scaffolding (mediated learning), 20
Schemata, 66
School mores, 122
Scotoma, 94
Search engines, 174–175
Selectivity, bias of, 47
Self-hypnosis, 71
Semantic interpretation, 104
Sensory-motor component, 84, 88
Servers and web hosting, 181
Set, 29, 32
Shevrin, Howard, 70
Showing, 137
Simple-complex continuum, 156–159
Skinner, B. F., 18
Social agencies mores, 121
Social agency influences, 85, 123–124
Society, as goal source, 11–13
Spatial relationships, 85, 88
Speaking, 85, 110–113
  cue-oriented, 112
  denotative/connotative accuracy, 111
  eager, 112
  fluency, 111
  interest index, 112
  length, 112
  level of vocabulary, 111
  pace, 112
  polysyllabic frequency, 111
  reticence, 112
  style of, 112
  versatility, 111
  word quality, 111
  word quantity, 111

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Standards, 8, 35; *see also* Evaluation; Visibility standards
  criterion-references, 8
  normative-references, 8–9
Stanford Achievement Test (SAT), 54
Stanford Scale for Hypnotic Susceptibility, 71
Still media, 139–140
Storyboard card, 160–162
Storyboarding, 58, 159–163
Streaming, 171
Structure analysis, 85, 110
  ability, 112
  distractibility index, 112
  listening, 113–114
  speaking, 110–111, 113
  style, 112
Subject specialists
  as goal source, 10–11
  professional organizations, 11, 213–216
Subjectivity, 47–48
Subliminal advertisements, 69–70
Subliminal techniques/messages, 69–73, 75, 78, 80
Supervision, 137
Susceptibility to suggestion, 71
Symbol manipulation component, 84–85, 88
Symbols and icons, 80, 107, 109, 140
Synergy, 3
Synnoetics, 85, 115–116
  leadership, 115
  moderate participation, 115
  non-participation, 115
Synthesis, 27–28

T

T1/T3 line, 179–180
Tachistoscope, 74–75
Tactile discrimination, 84, 97–100
  cold, 98
  dry, 100
  high/low viscosity, 99
  hot, 98
  irregular, 98
  malleable, 99
  mobile, 99
  moist, 99
  oscillatory, 99
  rigid/flexible, 98
  rough, 97
  slippery, 98
  smooth, 98
  static, 99
  tacky, 98
  warm, 98
  wet, 99
Task analysis, 21–23
  closeness of fit, 21
  characteristics of tasks, 22
Taxonomy of learning, 26–27
  affective domain, 29
  Bloom's taxonomy, 26–27
  cognitive domain, 27–29
  psychomotor domain, 29–31
Teachers, as instructional technologists, 2
"Teaching to the test," 43
Telling, 137
Thorndike, Edward, 18
Toffler, Alvin, 68
Top level domain (TLD), 175–176
Totic, Aleks, 170
Transactionals, 86, 127–128
  moderator, 127–128
Tyler model for goal setting, 6–7, 11
Tyler, Ralph W., 6–7

U

*Understanding Media: the Extensions of Man* (McLuhan), 64, 165
Uniform Resource Locator (URL), 173–174
Uniqueness, 57
United States Department of Education, e-learning goals, 191–194

V

Validation, 59–60, 199
Validity and reliability, 48
Value complex level, 29–30

Valuing level, 29–30
Variations, 153
Verbal symbols, 138
Verbals, 140
Vertical display, 147
Vertical plane, 140
Vicary, James, 69–70
Visibility standards, 141–142
  distance-line thickness, 145
  grid patterns, 145
  optical legibility, 144
  projection requirements, 142–143
  viewing problems, 143
Visual defects, 84, 92–94
  astigmatism, 94
  color blindness, 93
  diplopia, 94
  hyperopia, 93
  myopia, 93
  presbyopia, 94
  scotoma, 94
Visual display
  horizontal/vertical displays, 140
  interpretation of, 141
  projection requirements, 142–143
  visibility standards, 141–156
Visual literacy, 61–65, 136
  communication fundamentals, 63
  defined, 62
  figure-ground and embedding, 77–81
  hot/cool media, 64–65, 79
  symbols and icons, 80
Visual process, 135
Visual stimulus
  rheostat, 75–76
  tachistoscope, 74–75
Visuals
  attention techniques, 154–155
  balance, 152–154
  balance and, 149
  dominance, 151
  harmony, 153–154
  horizontal display surface, 140
  lines and attitude, 155
  mock-ups, 139
  models, 139
  motion media, 139
  optimal use of, 147–148
  pattern, 152
  real objects (realia), 139
  significant elements of, 155–156
  simple-complex continuum, 156–159
  simplicity of, 150–151
  still media, 139–140
  "Successful Design Produces Better Visuals Helpfully," 150, 158
  summary, 156–159
  variations, 153
  vertical plane, 140
Vygotsky, L. S., 20

**W**

Wall displays, 140
Watson, J. B., 17–18
World Wide Web, 165–183; *see also* Internet
  browsers, 169–171
  cookies, 181–182
  html, 173
  http, 172–173
  hypertext and hypermedia, 168–169
  instructional design and, 183–186
  Intel Indeo, 172
  the Internet and, 166–168
  intuitive usage, 175–176
  Java/JavaScript/Applets, 182–183
  NetShow Theater server, 171
  published addresses, 176
  Real Network's RealAudio, 172
  search engines, 174–175
  servers and web hosting, 181
  streaming, 171
  Uniform Resource Locator (URL), 173
Worth, 57
Writing, 84, 104–105

**Y**

Young-von Heolmhotlz theory of color vision, 93

**Z**

Zone of proximal development, 20

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